# microwave amplifier

## Model 560A

S/N 1707

MANUAL # 110-6013

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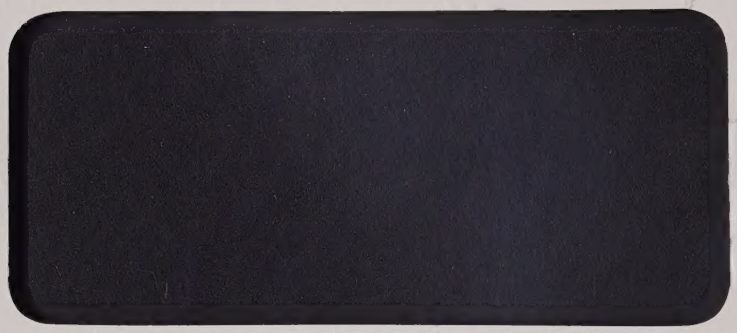

# INSTRUCTION MANUAL

# microwave amplifier

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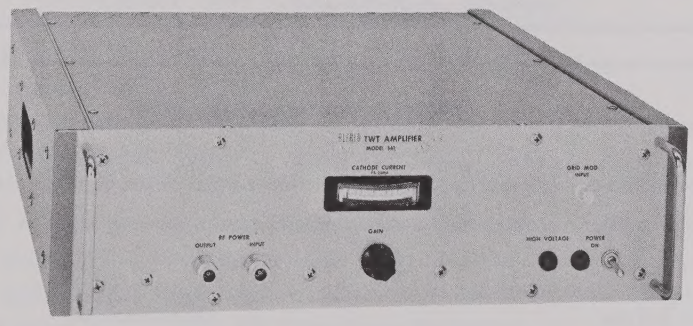


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The Singer Company, Palo Alto Operation

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1. Model or Type
2. Serial Number
3. Approximate date instrument was placed in operation
4. Approximate number of hours of use
5. Description of trouble(2)
6. Has maintenance action been previously requested?
7. Other comments

Upon receipt of this information our Service Department will send you service data or shipping instructions. Upon receipt of shipping instructions forward the instrument prepaid to the specified center or factory. If requested, an estimate of charges will be made before work begins.

(1) West Coast Service Center, 3211 S. LaCienega Blvd., Los Angeles, California 90016, Telephone (213) 870-2761, TWX 910-340-6352 for all Singer Instrumentation equipment; or Palo Alto Operation, 3176 Porter Drive, Palo Alto, California 94304, Telephone (415) 493-3231 TWX 910-373-1765 for Palo Alto Operation instruments.

(2) Include data on symptoms, measurements taken, test instruments used, suspected location of trouble, maintenance action taken, and any other relevant data.

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Schematics are included in the following order:

900682C - Low Voltage Power Supplies
900683C - Heater & High Voltage Supplies
900778C - High Voltage Anode Supply (560A & 561A)
900864C - Low Voltage Anode Supply (562A & 563A)
900777D - TWT Amplifier Main Chassis (560A & 561A)
900779D - TWT Amplifier Main Chassis (561A & 562A)

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# SECTION 1 — INTRODUCTION

## 1.1 SPECIFICATIONS

| | |
|---|---|
| Frequency Range: | Model 560A, 1 - 2 Gc<br>Model 561A, 2 - 4 Gc<br>Model 562A, 4 - 8 Gc<br>Model 563A, 7 - 12.4 Gc |
| Power Output: | 1 watt minimum. |
| Gain: | Small signal, 30 db minimum.<br>At rated power, 30 db minimum. |
| RF Impedance: | 50 ohms. |
| RF Connectors: | Type N Female. |
| Gain Adjustment: | Front panel control provides a 50 db control range. |
| Gain Variation with Line Voltage Variation: | 0.2 db or less at 1 watt output with a line voltage variation of 105 to 125 volts. |
| Maximum Mismatch for Rated Power Out: | 1.5:1 |
| For No Tube Damage: | 5 : 1 |
| Modulation: | GRID MOD INPUT connector coupled to ANODE of TWT. With the GAIN control set to no cathode current, a 0 to +10 volt signal turns cathode current of TWT to maximum. With the GAIN control set to maximum cathode current, a 0 to -10 volt signal turns cathode current of TWT off. Input impedance; 10 K Ω. |
| RF Rise Time: | Models 560A and 561A less than 4 μsec.<br>Models 562A and 563A less than 2 μsec. |
| Spurious Modulation: | At least 45 db below output signal level. |
| Time Delay: | Automatic 90 second time delay before application of high voltage. |

| | |
|---|---|
| Metering: | Cathode current by front panel meter. |
| Power Supply: | All electrode voltages are regulated. Protective relays turn off traveling wave tube power on helix overcurrent. |
| Power Input: | 105 to 125 volts or 210 to 250 volts; 50/60 cycles/second; approximately 250 voltamperes. |
| Physical: | See Figure 1-1. |
| Weight: | Less than 43 pounds. |

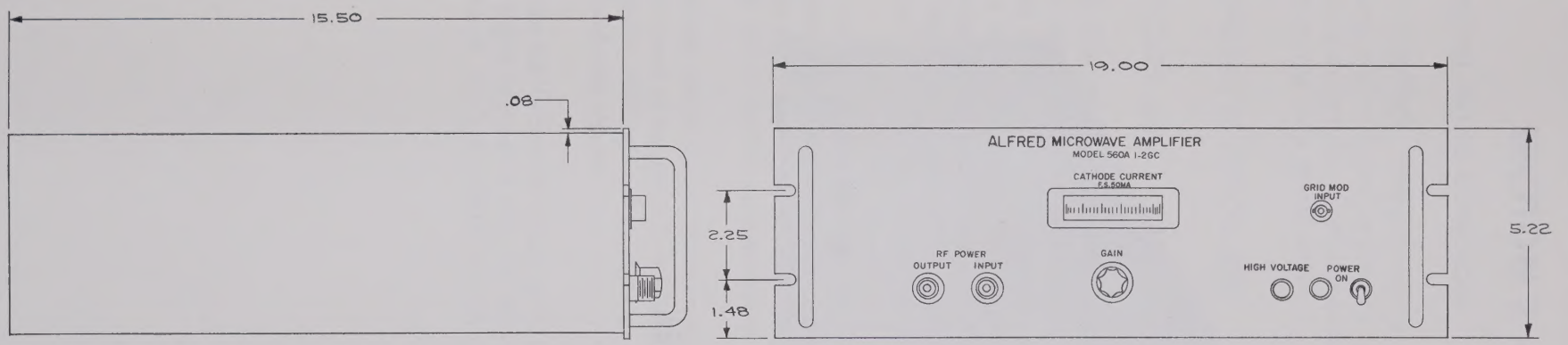
## 1.2 DESCRIPTION

The ALFRED 560A Series Microwave Amplifiers are amplifiers and modulators of microwave signals in the frequency range of 1 to 12.4 Gc. They are high gain (30 db) instruments utilizing a traveling wave tube powered by low drift, low ripple, precisely regulated transistorized power supplies.

The anode (positive grid) of the traveling wave tube is coupled to the GRID MOD INPUT jack. Modulation of the rf can be accomplished by either a 0 to +10 volt or a 0 to -10 volt signal applied through the connector. The front panel gain control varies the traveling wave tube cathode current over a 50 db range.

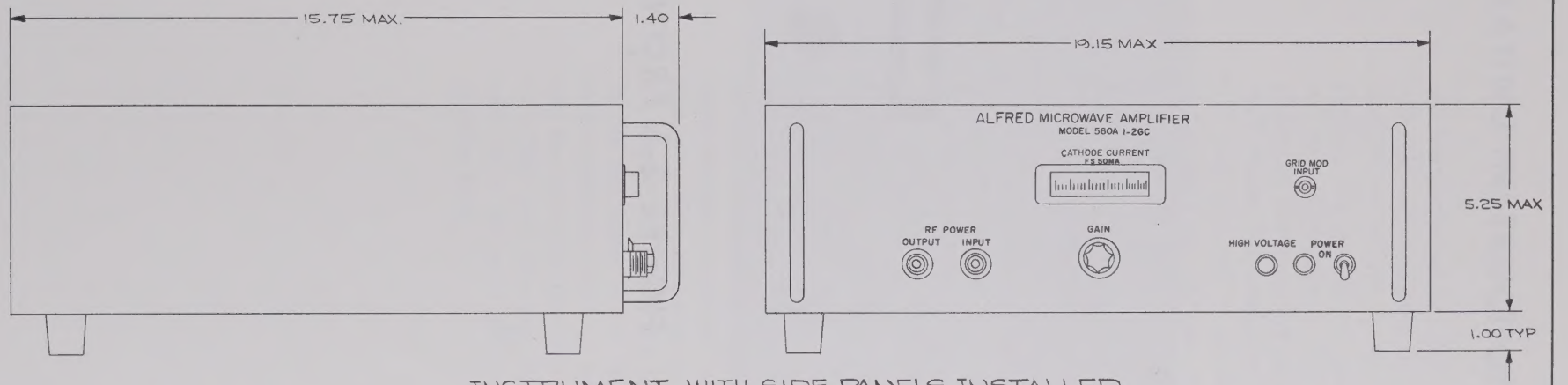
The traveling wave tube does not require rf adjustment, is encapsulated for protection and is easily replaced. A front panel meter monitors cathode current. Protective circuits reduce the likelihood of damage to the tube.

| SYM | DESCRIPTION | NO. | DATE | BY |
|---|---|---|---|---|
| | | | | |




INSTRUMENT WITH SIDE PANELS REMOVED

(FOR RACK MOUNTING)




INSTRUMENT WITH SIDE PANELS INSTALLED

NOTES:

1. THE MODEL 560A SERIES INSTRUMENT MAY BE EITHER BENCH MOUNTED OR RACK MOUNTED.
2. FOR RACK MOUNTING, REMOVE BOTH SIDE PANELS.
3. WEIGHT OF INSTRUMENT IS LESS THAN 43 POUNDS.

FIGURE 1-1

| ITEM | REQD | PART NO. | DESCRIPTION |
|---|---|---|---|
| | | | |

LIST OF MATERIAL

| | | | |
|---|---|---|---|
| MATERIAL | DRAWN Dave Presley | DATE 9-2-64 | OUTLINE & DIMENSIONAL DATA FOR MODEL 560A SERIES INSTRUMENT |
| MATERIAL STOCK NO. | ENG G. Oshima | 9-4-64 | ALFRED ELECTRONICS, PALO ALTO, CALIFORNIA |
| FINISH OR TREATMENT | PROD | | 990131C |
| | SCALE 1:2 | | DIMENSIONS ARE IN INCHES TOL: .XX ± .015, .XXX ± .005, ANGLE ± ½° UNLESS INDICATED OTHERWISE |

| NEXT ASSY | USED ON |
|---|---|
| | 560A SERIES |

SHEET 1 OF 1

**FIGURE 2-1. FRONT PANEL**

# SECTION 2 — OPERATING INSTRUCTIONS

## 2.1 FRONT PANEL CONTROLS

GAIN CONTROL: The gain control adjusts the cathode current and hence the gain of the traveling wave tube. Cathode current is monitored by the front panel meter.

## 2.2 OPERATING PROCEDURES

Turn POWER switch to ON.

NOTE: Time delay relays used in the Model 560A Series delay high voltage turn-on for approximately 90 seconds after the power is turned on. This is to allow a brief warm-up period for the traveling wave tube filament. If the ac power is off for only an instant, the normal 90 second delay will occur before the high voltage returns.

After the high voltage appears the unit is ready for operation. Rf power and modulation voltages can be applied to the RF POWER INPUT and GRID MOD INPUT connectors respectively.

The Model 560A Series Microwave Amplifiers are designed to accept a 0 to -10 volt modulation signal although a 0 to +10 volt signal will also modulate the rf.

With the GAIN control turned up (clockwise) an input signal between 0 and -10 volts will modulate the rf. With the GAIN control turned down (counterclockwise) an input signal between 0 and +10 volts will modulate the rf. To obtain 100% modulation of the rf, the GAIN control and possibly the modulation input signals amplitude will require adjustment. This can best be accomplished by observing the detected rf signal on an oscilloscope. The conditions for 100% modulation will vary from unit to unit because of variations in the operating voltages of the traveling wave tubes.

Any applied modulation voltage which is less than the voltage required for 100% modulation will only partially modulate the rf. Any applied modulation voltage which is greater than the voltage required for 100% modulation will overdrive the preamplifier. However, no damage will occur because the input is adequately protected.

## 2.3 POWER REQUIREMENTS

The unit is normally connected at the factory for operation at 105 to 125 volts and 50 to 60 cycles ac (115 volts nominal). However, provisions are made for easy conversion to operation at 210 to 250 volts, 50 to 60 cycles ac (230 volts nominal). See Figure 4-2. With the bottom cover removed locate the power switch labeled 115 VAC. By removing and reversing this plate, the switch can be moved to the left. Replace the plate with 230 VAC showing. Replace the 3 ampere main fuse (in back of instrument) with a 1.5 ampere fuse.

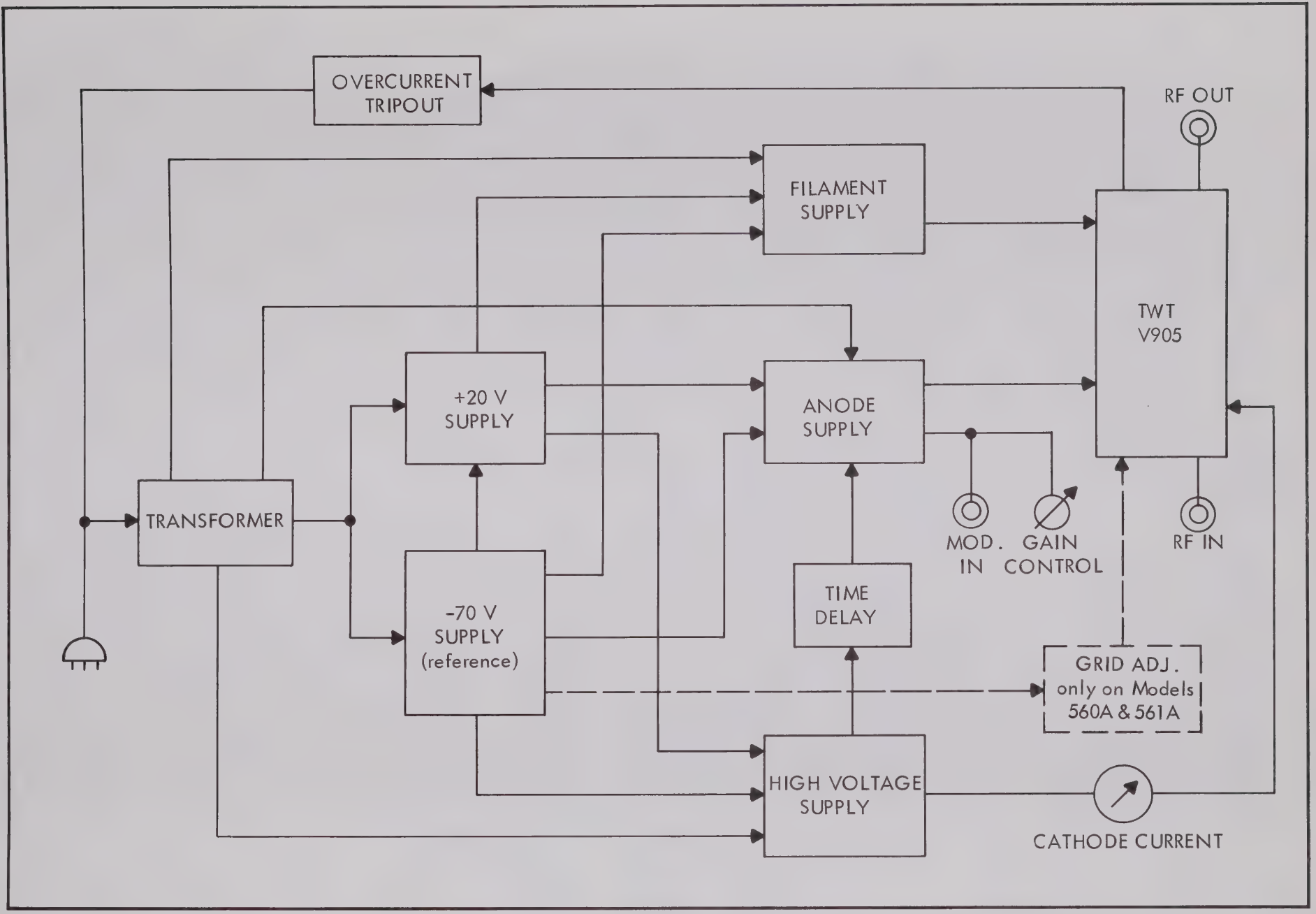



**FIGURE 3-0. BLOCK DIAGRAM OF MODEL 560A SERIES TWT AMPLIFIER**

# SECTION 3— CIRCUIT DESCRIPTION

## 3.1 THE TRAVELING WAVE TUBE

The traveling wave tube consists of an electron gun, a slow wave structure (helix) and a collector at the far end of the slow wave structure. The electron gun produces a beam of electrons which travel along the axis of the helix to the collector. The forces produced by a longitudinal magnetic field, which surrounds the tube, restricts beam travel axially along the tube, just inside the helix. The rf signal to be amplified is coupled to the helix, at the electron gun end, and travels down the metallic path of the helix in the same direction as the beam. The velocity of the electron beam is determined by the potential difference between the cathode and the helix, and this voltage difference is adjusted so that the beam velocity down the tube is just a little faster than the rf wave. The alternating field produced by the rf signal causes the electrons to bunch. As the rf field advances towards the collector, it encounters more and more bunches of electrons. Amplification occurs when these groups of electrons give up energy to the rf signal as it travels down the helix. The amplified waves are then coupled off the helix through a low impedance device. Reflections are prevented by an attenuator; a lossy helix placed externally between input and output.

A more complete description of traveling wave tube theory and operation is presented in the "Engineering Notes" at the end of this manual.

## 3.2 POWER SUPPLIES

See Block Diagram Figure 3-0.

The unit has four independent power supplies; the +20 volt supply, the ANODE supply, the HEATER supply, and the HIGH VOLTAGE supply, all of which use a fifth supply, the -70 volt supply as a reference. The -70 volt supply, in turn, uses a temperature compensated zener diode as its reference.

### 3.2.1 THE +20 AND THE -70 VOLT POWER SUPPLIES (LOW VOLTAGE)

See Figure 3-1.

These two supplies consist essentially of two differential amplifiers; Q209-Q210 and Q211-Q212 for the -70 volt supply and Q203-Q204 and Q205-Q206 for the +20 volt supply. CR203 is a temperature compensated 6.2 volt zener diode and is contained on one side of the first differential amplifier of the -70 volt supply. The differential amplifiers, of each supply, feed the driver stage of power transistors Q202 (+20 volt) and Q208 (-70 volt) which are used as series regulators. The -70 volt supply can be adjusted by means of R221. A zener diode is used to start and to protect the -70 volt supply while a transistor circuit is used to start and protect the +20 volt supply.

### 3.2.2 THE HEATER AND HIGH VOLTAGE SUPPLIES

See Figure 3-2.

The HEATER supply for the traveling wave tube is referenced to both the +20 and -70 volt supplies, making it independent of both line and load. This 6.3 volt supply can deliver up to 2 1/2 amperes to the filament with only a nominal change in ripple or regulation.

The HIGH VOLTAGE supply (Helix and Collector) is capable of delivering 50 ma at 2.7 kv. The magnitude of this voltage is set by feedback resistors R926 through R932 and potentiometer R309. A one microfarad capacitor is used in the output of this supply to prevent fluctuations due to changes in current or load. The HELIX CURRENT TRIP-OUT circuit is essentially a

summing amplifier and operates such that if more current is taken from the base of Q401 than that specified, the succeeding amplifiers saturate causing relays K901 and K904 to trip, opening the line to the power transformers. (See Table 4-1).

### 3.2.3 THE ANODE SUPPLY

See Figures 3-3 and 3-4.

The ANODE supply is the most critical of all the supplies in the unit. Its function is to supply a regulated and stable voltage to the anode of the traveling wave tube and yet it must have a very fast response to meet the modulation specifications.

The anode of the traveling wave tube is a positive, low current electrode which controls cathode current and hence the gain and power output of the tube. The anode is the element that is used for the purpose of modulation. The modulation input jack is coupled to the preamplifier for the anode supply. When a modulation voltage is applied, the preamplifier drives the entire anode supply. The anode supply is adjustable by the ANODE MAX potentiometer R111 for the 560A and 561A or R119 for the 562A and 563A.

3.2.3.1 HIGH VOLTAGE ANODE SUPPLY (560A/561A). In the 560A/561A Series, High Voltage Anode Supply PC Board PC100 drives regulator amplifier tube V906 to control regulator tube V904. V904, in series with the anode supply output from PC400-10, controls the voltage applied to the TWT Anode (Grid 2) which is connected to the V904 cathode via CR914. V904 thus provides a variable voltage drop, controlled by PC100, between the PC400-10 output and the TWT. CR914 (Fig. 3-2), supplies an additional fixed drop of 56 V, with the result that the output at the TWT is controlled between 0 and + 650 V.

On PC100 (Fig. 3-3), Q103 and Q104 constitute the differential input stage of the anode supply voltage control amplifier. Three separate control inputs are supplied to Q103: (1) the feedback signal proportional to instantaneous anode voltage, tapped from the TWT anode via C915/R925 and applied to PC100-E; (2) a variable offset signal tapped from the panel GAIN Control R923 and/or a modulation input from GRID MOD INPUT jack J910, amplified by Q101; (3) a disabling signal from K902, supplied whenever high voltage is turned off by that relay, coupled to Q103 by Q102.

A negative-going signal level change at the base of Q103 causes it to conduct more heavily, driving the differential stage to reduce the conduction of Q104. Q104 controls the current through output stage Q105 which provides voltage gain. A negative-going change at the base of Q103 thus decreases the current through load resistor R120 and increases the negative voltage applied to the grid of V906 via J100-Y. This drop in grid voltage reduces the conduction of V906, thereby decreasing the drop across its load resistor R910. (R910 is connected to the regulated anode supply output voltage line PC400-7 by K905 after initial turn-on.) This drop across R910 determines the grid-to-cathode bias of V904, in this case biasing V904 to heavier conduction so that its plate-to-cathode drop is decreased, thus raising the anode voltage. Maximum output voltage at the cathode of V904 is > 706 V. This is dropped 56 V by CR914 to a maximum of > 650 V at TB901-3 to drive the TWT anode.

Conversely, a positive-going change at the base of Q103 produces a decrease in anode voltage by the reverse of the process described above. The dynamic range of the Q103/Q104 stage is such that the base of Q103 operates at or below ground level, with a ground-level signal turning "off" the anode supply output by biasing V904 to the point where its cathode is at < + 56 V, which is translated to < 0 V at the TWT anode (TB903-3) by CR914.

Turning the GAIN control R923 CW to increase gain causes an increasingly positive voltage to

be applied to J100-B, thereby tending to decrease the forward bias of Q101 and reduce its conduction. This decreases the current through R106 and thus produces a negative-going change at the base of Q103, as required to raise the anode voltage as described above. The GAIN control and GRID MOD INPUT signals are summed at the base of Q101, allowing use of a modulation signal of either polarity by proper adjustment of the GAIN control to provide suitable offset. Thus, with the GAIN control fully CW (+20 V), Q101 is biased almost to cutoff and a 0 to -10 V MOD signal can be applied to turn it on and off for anode voltage modulation. With the GAIN control fully CCW (0 V), Q101 is biased to saturation, and a 0 to +10 V signal can be applied to turn it off and on for anode voltage modulation. The drop across R103 and the filtering action of C101 stabilizes the steady bias voltage from the GAIN control and provides isolation between the dc signal from the GAIN control and the pulsed MOD signal.

The feedback signal to J100-E tracks the instantaneous anode voltage to provide negative feedback to the base of Q103 via R111. R111 is used to set the feedback level at the maximum output point when the GAIN control is fully CW.

K902, which enables high voltage power, supplies -70 V to the base of Q102 whenever K902 is de-energized to turn off high voltage power. This -70 V input causes Q102 to saturate, thereby raising the base of Q103 to ground level, the point at which 0 V anode supply output is obtained.

3.2.3.2 LOW VOLTAGE ANODE SUPPLY (562A/563A). In the 562A/563A Series, Low Voltage Anode Supply PC Board PC100 provides output of 0 to +60 V to drive the TWT anode. Q103 and Q104 constitute a regulator circuit for the +80 V supply output from PC400-8. Q103 senses the output level at the junction between R108 and R111, and controls the conduction of Q104 so that R113 shunts the supply output by the proper amount to achieve a +80 V output level.

Q106 is the input stage of the anode supply voltage control amplifier. Three separate control inputs are supplied to Q106: (1) the feedback signal proportional to instantaneous anode voltage, tapped from the output at the collector of Q108 and impedance-converted by emitter follower Q105; (2) a variable offset signal tapped from the panel GAIN control R923 and/or a modulation input from GRID MOD INPUT jack J910, amplified by Q101; (3) a disabling signal from K902, supplied whenever high voltage is turned off by that relay, coupled to Q106 by Q102.

A negative-going signal change at the base of Q106 causes it to conduct more strongly, thereby increasing the current through R123 so that the base voltage of Q107 becomes less negative. This causes Q107 to conduct more heavily, driving the Q107/Q108 differential stage to produce a decrease in the conduction of Q108. The resultant decrease in current through R130 produces an increase in the voltage at the base of Q109. This increase drives Q109 to heavier conduction and raises the anode supply output voltage at J100-V. Conversely, a positive-going signal change at the base of Q106 produces a decrease in the anode supply output voltage.

Turning the GAIN control R923 CW to increase gain causes an increasingly positive voltage to be applied to J100-C, thereby tending to decrease the forward bias of Q101 and reduce its conduction. This decreases the current through R107 and thus produces a negative-going change at the base of Q106, as required to raise the anode voltage as described above. The GAIN control and GRID MOD INPUT signals are summed at the base of Q101, allowing use of a modulation signal of either polarity by proper adjustment of the GAIN control to provide suitable offset. Thus, with the GAIN control fully CW (+20 V), Q101 is biased almost to cutoff and a 0 to -10 V

MOD signal can be applied to turn it on and off for anode voltage modulation. With the GAIN control fully CCW ( 0 V), Q101 is biased to saturation and a 0 to +10 V signal can be applied to turn it off and on for anode voltage modulation. The drop across R105 and the filtering action of C101 stabilizes the steady bias voltage from the GAIN control and provides isolation between the dc signal from the GAIN control and the pulsed MOD signal.

The feedback signal from Q105 tracks the instantaneous anode voltage to provide negative feedback to the base of Q106 via R119. R119 is used to set the feedback level at the maximum output point when the GAIN control is fully CW.

K902, which enables high voltage power, supplies -70 V to the base of Q102 whenever, K902 is de-energized to turn off high voltage power. This -70 V input causes Q102 to saturate, thereby raising the base of Q103 to ground level, the point at which 0V anode supply output is obtained.

Table 3-1. Functions of Interlock Relays and Switches in the 560A Series

| Component | Energized by | De-Energized by | Function |
|---|---|---|---|
| K901 | T903, when power is connected between points Y and $Y_1$ (which occurs when K904 is energized due to a helix overcurrent condition). Once energized, K901 is self-latching by means of power supplied from #16-17 of T902. | Turning POWER switch off and then on, to break self-latching circuit, after helix overcurrent trouble has been corrected, so that K904 no longer completes the power circuit between points Y and $Y_1$. | A power control interlock relay which applies 115 V power for T901 to one contact of K902, thereby allowing K902 to energize high voltage transformer T901 except when a helix overcurrent condition exists. |
| K902 | K906 and K903, when K906 is de-energized and K903 is energized. K906 is de-energized when a heater over-voltage condition does not exist, and K903 is energized (also by a circuit through de-energized K906) after a 90-second delay whenever power is applied to the instrument. Once energized, K902 is self-latching as long as K906 remains de-energized. | Energization of K906 due to a heater over-voltage condition, or by inoperation of time delay relay K903. | Controls primary 115 V power input to high voltage transformer T901, enabling high voltage output only when energized. When de-energized, applies -70 V to J100-Z (560A/561A) or J100-J (562A/563A) to disable the anode supply by biasing Q102 to heavy conduction, thereby dropping the anode supply output from its normal + level to ground level. |
| K903 | K902 and K906, when both de-energized, supply power to the K903 time delay coil. The K903 contact is closed 90 seconds later. | When the K903 contact is closed after the 90-second time delay, it energizes K902, and the form C contact on K902 then de-energizes K903 at the same time it self-latches K902. | Delays turn-on of high voltage power circuits driven by T901 until the low voltage power circuits and the TWT heater driven by T902 have been allowed a 90-second warmup interval. |
| K904 | Q402, when driven to saturation by the cutoff of Q401 when excess current is taken from the base circuit of Q401 by a helix overcurrent condition. | Cutoff of Q402 when Q401 is turned on under operating conditions where helix current is within the permissible range so that the drop across R405 is not excessive. | Turns off high voltage power for protection of the TWT against helix overcurrent, by energizing T903 which, in turn, energizes K901 when an overcurrent condition occurs, causing K901 to remove power from terminal 1 of T901. |

Table 3-1. Functions of Interlock Relays and Switches in the 560A Series (cont)

| Component | Energized by | De-Energized by | Function |
|---|---|---|---|
| K905 | PC400 Screen Supplies and C409 (560A/561A); T902 and C914 (562A/563A), when the capacitor has charged up to relay-operating voltage after power turn-on. | Turn-off of power to instrument. | Provides a time delay in the turn-on of the Anode Supply by opening the + voltage supply line to regulator V906 (560A/561A) or grounding the +80 V supply line to J100-Z (562A/563A). |
| K906 | Saturation of heater over-voltage amplifier Q904 when excessive heater voltage appears across R920. | Cutoff of Q904 when heater over-voltage condition is eliminated. | Through one set of contacts, breaks the heater supply circuit to J300-T to prevent over-voltage damage to the TWT heater. Through another set of contacts de-energizes K902 to remove high voltage power (since K902, in turn, de-energizes T901). |
| S903 High Voltage Interlock Switch | Closed by proper installation of top cover panel. | Opened by removing top cover panel. | When closed, completes 115 V primary power circuit to T901 via K901 and K902. When opened, removes power from T901 to eliminate high voltage exposure danger. |
| S904 Air Flow Interlock Switch | Closed by exposure to suitable air flow pressure from fan. | Opens when insufficient air circulation exists. | When closed, completes 115 V primary power circuit to T901 via K901, K902, and S903. When opened, removes power from T901 to shut off the TWT tube in the absence of sufficient cooling air circulation. |

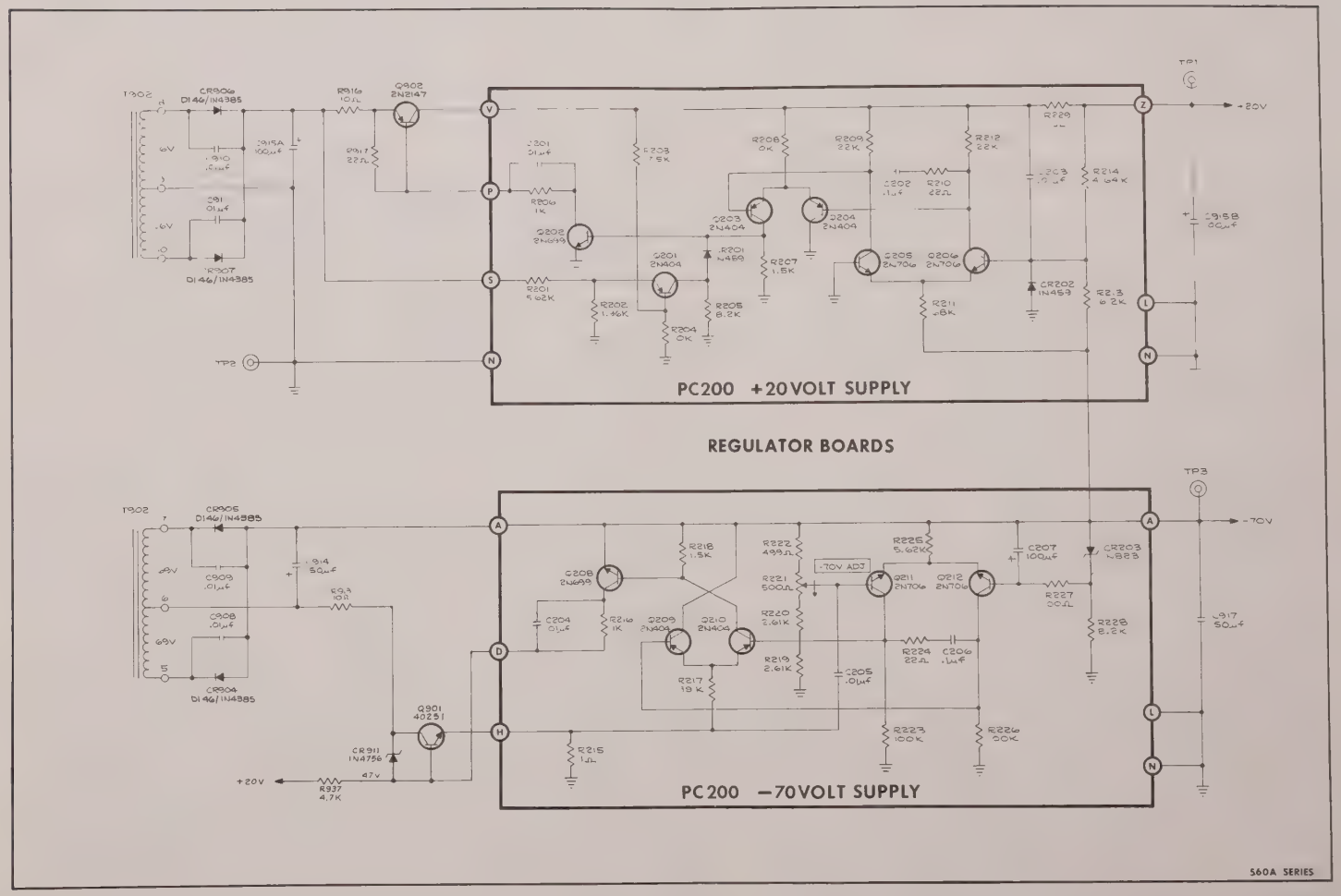



FIGURE 3-1. +20V AND -70V SUPPLIES

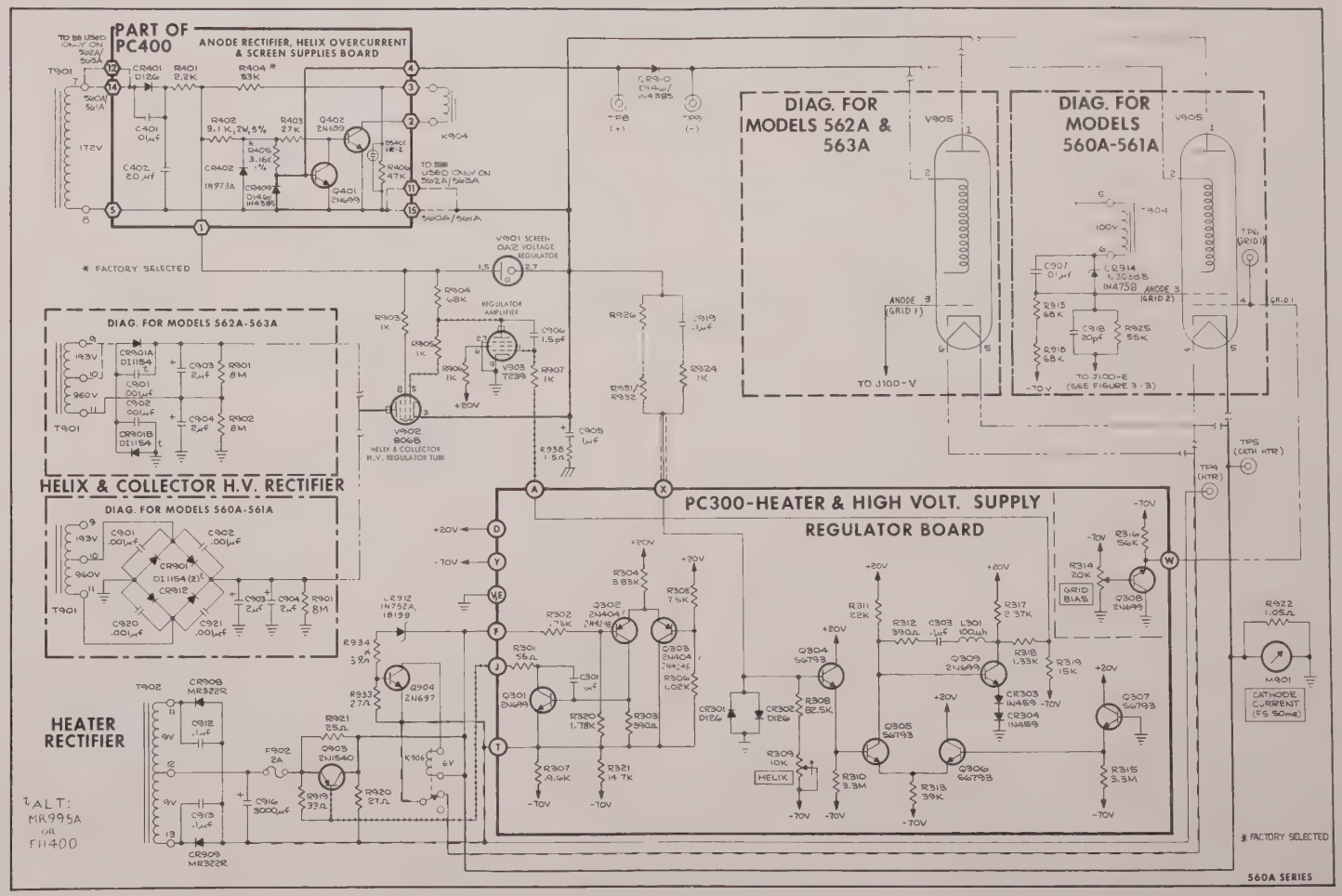



FIGURE 3-2. HEATER AND HIGH VOLTAGE SUPPLIES

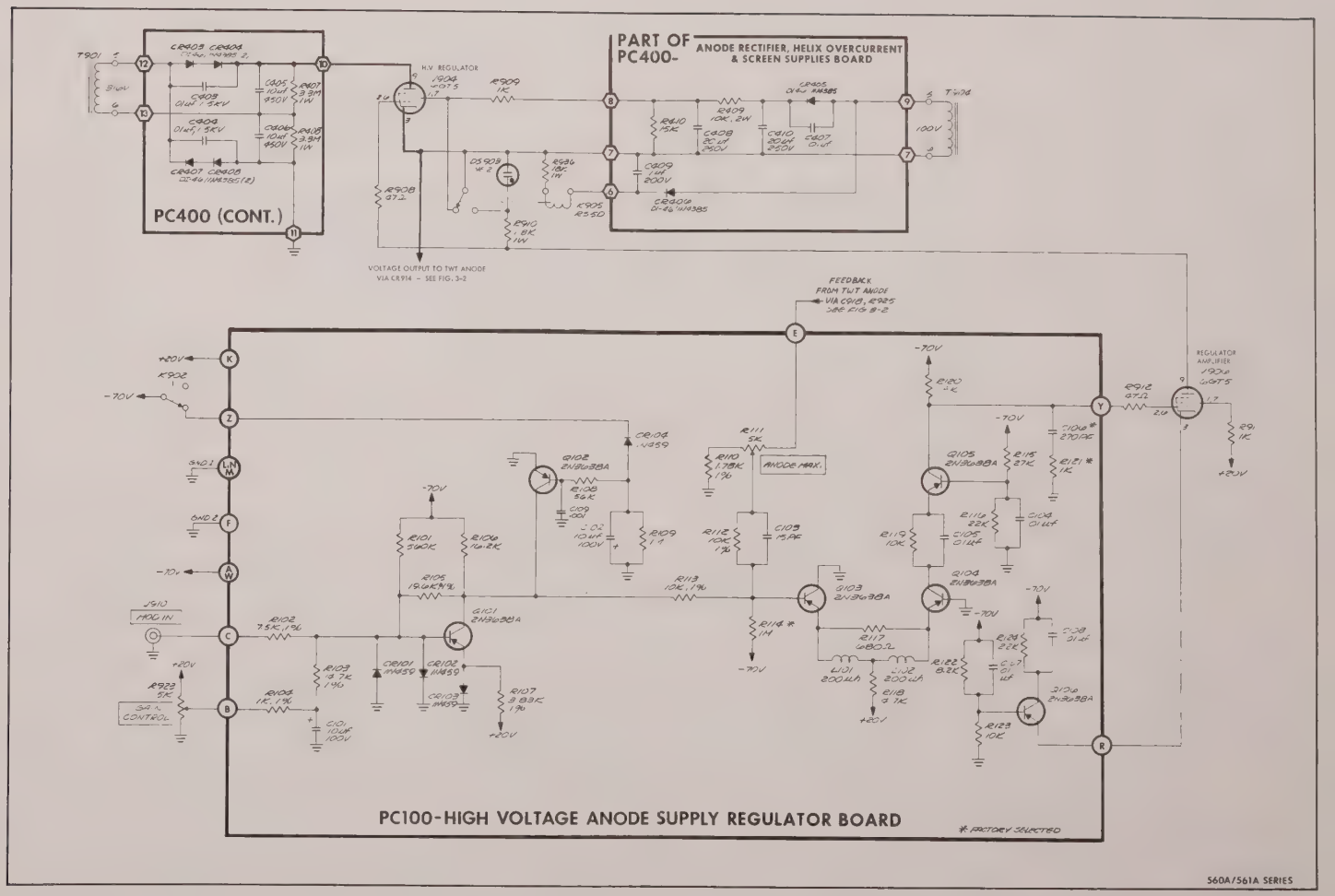

PC400 (CONT.)
PART OF PC400-
ANODE RECTIFIER, HELIX OVERCURRENT & SCREEN SUPPLIES BOARD
H.V. REGULATOR
VOLTAGE OUTPUT TO TWT ANODE VIA CR914 - SEE FIG. 3-2
FEEDBACK FROM TWT ANODE VIA C910, E925 SEE FIG 3-2
REGULATOR AMPLIFIER
ANODE MAX.
PC100-HIGH VOLTAGE ANODE SUPPLY REGULATOR BOARD
* FACTORY SELECTED
560A/561A SERIES

FIGURE 3-3. 560A/561A (HIGH VOLTAGE) ANODE SUPPLY

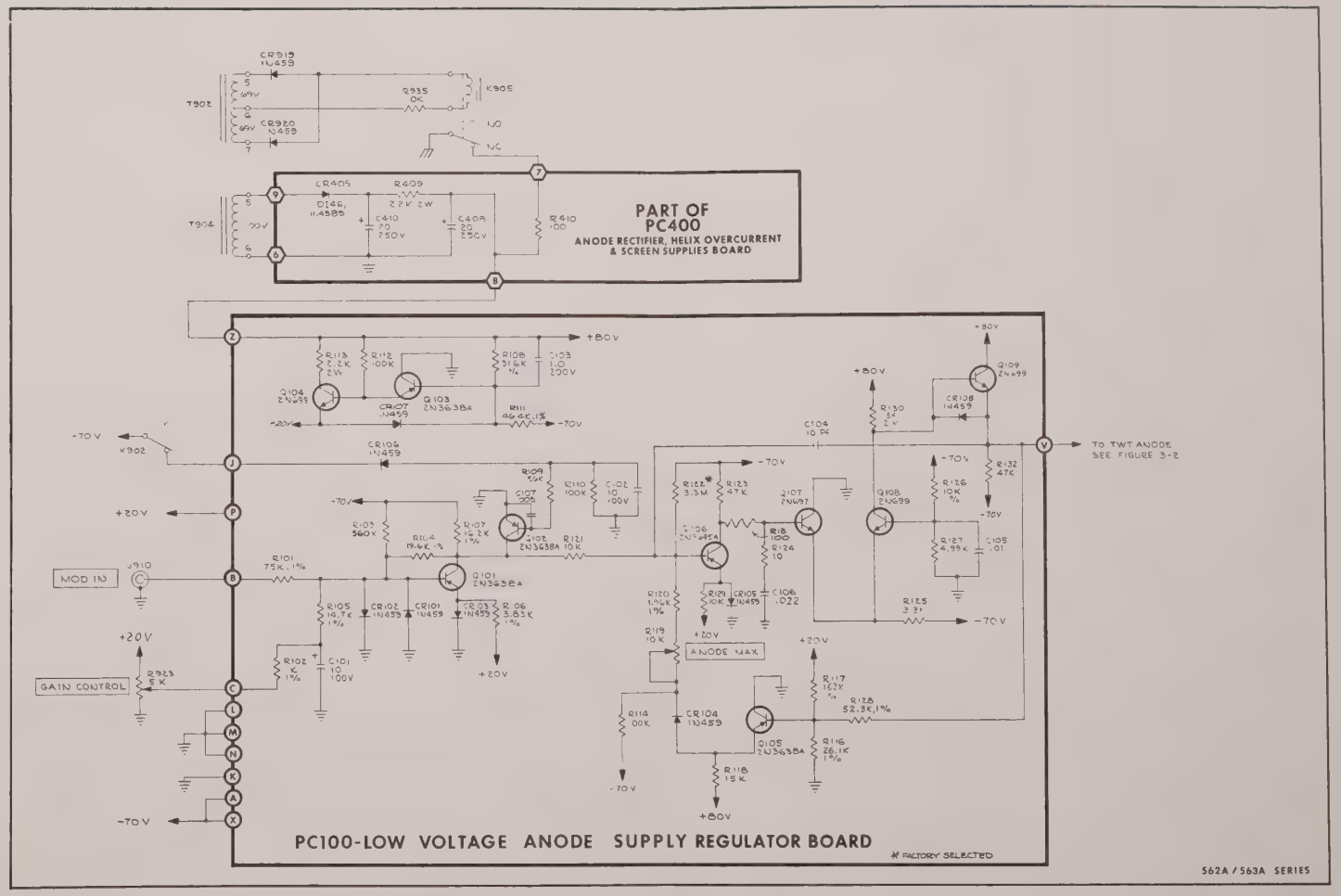



FIGURE 3-4. 562A/563A (LOW VOLTAGE) ANODE SUPPLY

# SECTION 4 — MAINTENANCE

## 4.1 PERIODIC MAINTENANCE

Perform the following maintenance on the Model 560A at least every six months or as often as necessary:

a. Remove all accumulated dust with forced air.

b. Visually inspect the unit for loose or broken connections, loose panel controls or connections, improperly seated tubes, bent or broken tube pins, etc. Replace worn-out components as required.

c. Check voltages at test points as directed in Paragraph 4.2.

d. Make a performance check in accordance with the procedure of Paragraph 4.6.

CAUTION: High voltages within the chassis of this instrument constitute a hazard to anyone performing maintenance on the unit. Before working on this instrument, carefully read all of Section 4 of this manual.

## 4.2. VOLTAGE MEASUREMENTS AT CHASSIS TEST POINTS.

Test points are provided underneath the top cover of the Model 560. Removal of the top cover disables the high voltage, and will therefore require "cheating" of the top cover interlock switch to make high voltage tests.

### 4.2.1 SUPPLY VOLTAGE MEASUREMENTS

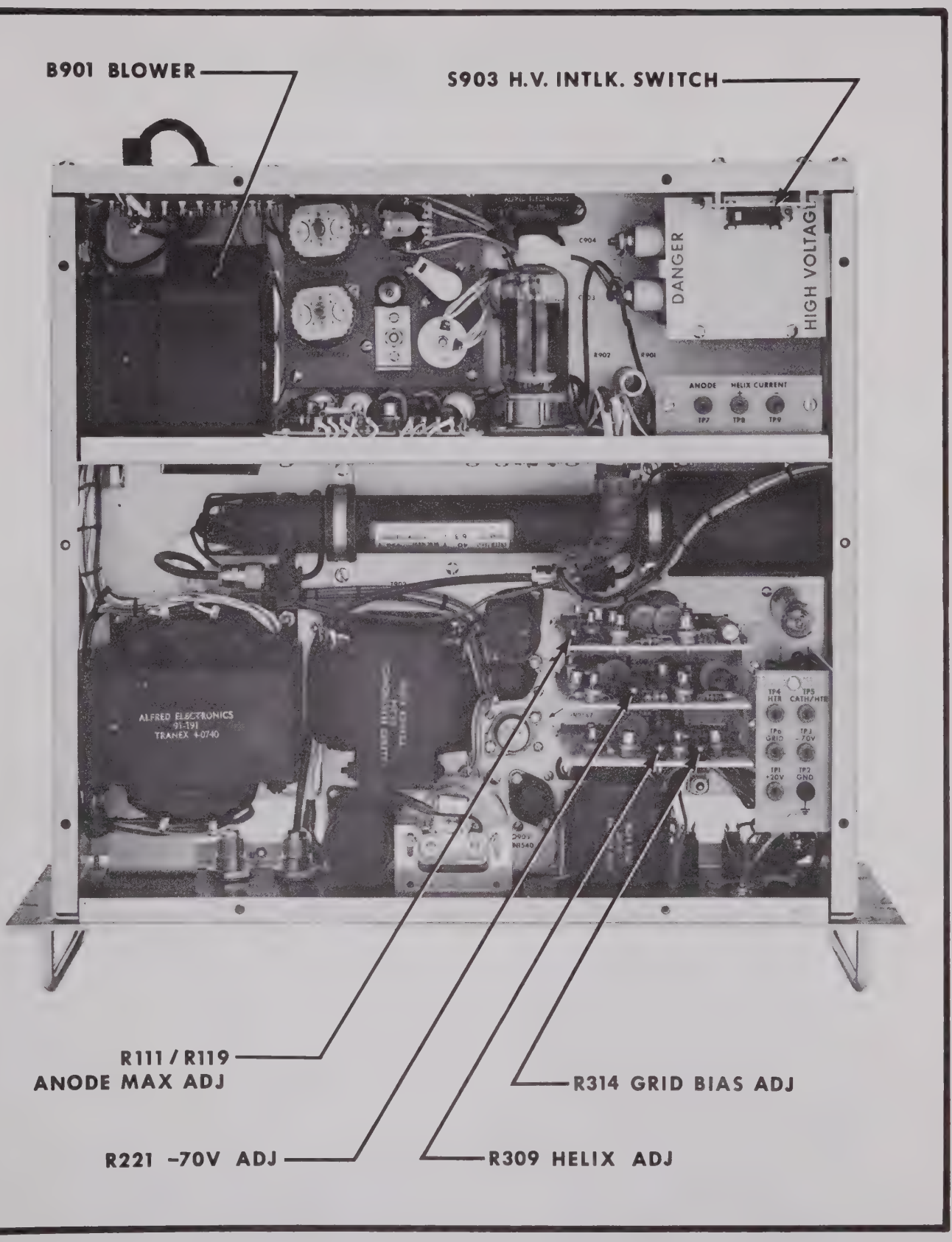
Supply voltages and tolerances are given in Table 4-2. Pay attention to the test instrument polarities shown, in order that test equipment, the instrument under test, and personnel testing the instrument not be harmed. Make connections before applying high voltage.

### 4.2.2 TEST EQUIPMENT

The test instruments listed in Table 4-1, or their equivalents, should be used in making maintenance checks.

Table 4-1. Recommended Test Equipment.

| Instrument | Manufacturer/Model No. (or equivalent) |
|---|---|
| Digital Voltmeter (for precise low-voltage measurements) | HP: 3459A or HP/3430A (four or five-place; up to 600 V) |
| Vacuum Tube Voltmeter (for high-voltage measurements) | HP: 410B with 11044A DC Divider (up to 2600 V) |
| Network Analyzer (for power level and rf performance measurements) | Alfred: 8000/7051 with 1403 Crystal Detector Set |
| Alternate for Network Analyzer: Power Meter | HP: 431C |
| Floating Multimeter (for current measurements) | Triplett: 630A |
| Metered Variac (for line voltage variation simulation) | Gen. Radio: WSMT3W |
| Sweep Oscillator (rf source to drive amplifier for rf tests) | Alfred: 650 with plug-in oscillator head for the frequency range of interest. |
| Variable RF Attenuator (to vary rf source power for gain tests) | Alfred: E100 Series unit for the frequency range of interest. |
| RF Pad Attenuators (to reduce amplifier rf output to power meter) | Narda: 777, 20 db and 6 db for the frequency range of interest. |



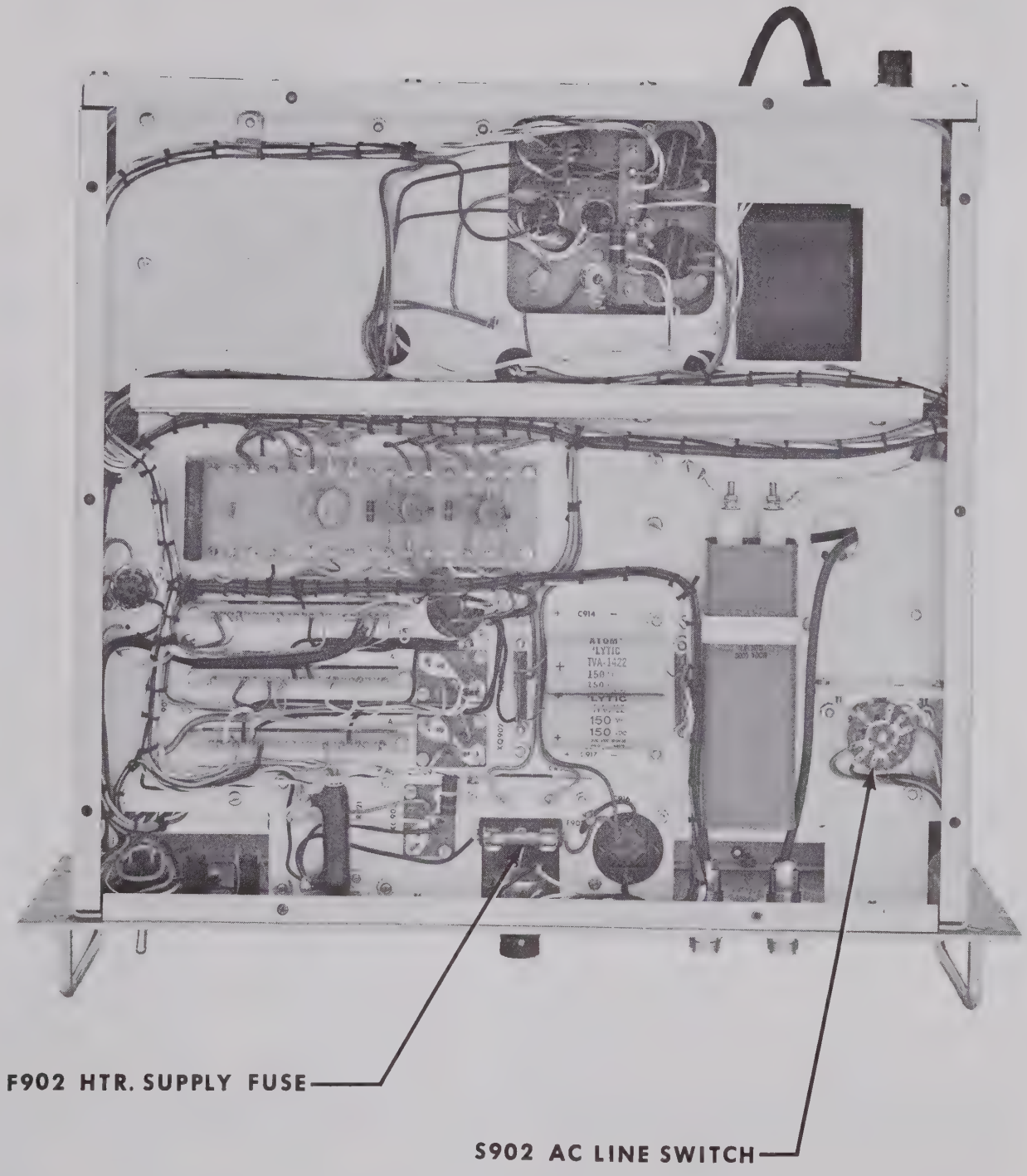

TOP VIEW

FIGURE 4-1

Table 4-2. Voltage Measurements

| Voltage | Set To | Adjust | Ripple | Test Points and Signal Polarity (-) | | (+) |
|---|---|---|---|---|---|---|
| **Group 1 - Low-Voltage and Medium-Voltage Supply Checks (these checks are made with a floating digital voltmeter)** | | | | | | |
| [Low Voltage Supplies] | | | | | | |
| -70 V | -70.00 ± .05 V | R221 | 6 mv. | TP3 | t | TP2 |
| +20 V | +20.0 ± .6 V | Adjustment of +20 V supply relies on initial adjustment of -70 V supply. If -70 V supply is set correctly, +20 V supply should be in spec. | 3 mv. | TP2 | t | TP1 |
| +6.3 V (Measure with high voltage off, i.e. do not defeat top cover interlock) | +6.3 ± .3 V | Adjustment of 6.3 V supply relies on initial adjustment of -70 V supply. If -70 V supply is set correctly, 6.3 V supply should be in spec. | 500 mv. | TP5 | | TP4 |
| [Focusing Grid (560A/561A only)] | | | | | | |
| Grid #1 (560A/561A) | Check envelope at rear of manual | R314 | | TP6 | t | TP2 |
| [Anode] | | | | | | |
| Grid 2 (560A/561A) | Check envelope at rear of manual | R111 (560A/561A) | 50 mv. | TP2 | t | TB901-3 |
| Grid 1 (562A/563A) | Check envelope at rear of manual | R119 (562A/563A) | 50 mv. | TP2 | t | TB901-3 |
| **Group 2 - High-Voltage Supply Check (this check is made using a Vacuum-Tube voltmeter with high-voltage probe; top cover interlock must be defeated to energize high voltage).** | | | | | | |
| [Helix] | | | | | | |
| Helix (Cathode) | Check envelope at rear of manual | R309 | 6 mv. | TP2 | | TP8 |
| **Group 3 - Helix current check (this check is made with an insulated, floating multimeter in the 10 ma range with high voltage on)** | | | | | | |
| Helix I | Check envelope at rear of manual | See par. 4-4. | | TP9 | | TP8 |

t If the recommended voltmeter is used, the LOW level probe should be attached to TP2 (chassis ground) for all Group 1 measurements except +6.3 V.




BOTTOM VIEW

FIGURE 4-2

## 4.3 TROUBLE SHOOTING

### 4.3.1 STEPS TO FOLLOW WHEN FAILURE OCCURS.

First check all voltages, if possible, in accordance with Paragraph 4.2.1 (Table 4-2).

> NOTE: Before attempting to trouble-shoot the unit, ascertain that the apparent trouble is actually due to a malfunction within the instrument and not to improper usage.

If power supply problems rule out voltage checks, refer to Table 4-3 for help in trying to localize the instrument failure.

### 4.3.2 USE OF THE TROUBLE-SHOOTING TABLE.

Table 4-3 provides basic trouble shooting information for the Model 560 instrument. Use of this table will help to localize a malfunction to a specific circuit or circuits.

## 4.4 INTERNAL ADJUSTMENTS.

The Model 560 instruments contain four internal potentiometers used for calibration of the unit. The following paragraphs contain pertinent information concerning these potentiometers, their adjustment, and their use and affect on Model 560 performance.

### 4.4.1 LOW VOLTAGE (-70 V) ADJUSTMENT.

The -70 V Adjust (R221) is used to calibrate the -70 V supply. This calibration also serves as the regulating reference for the +20 V and 6.3 V supplies. Adjust R221 only when necessary to bring the -70 V supply into spec. This will automatically calibrate the +20 V and 6.3 V supplies unless they are defective.

The -70 V Adjust (R221) is factory set and should NOT require readjustment unless components in the -70 V, +20 V, or 6.3 V supplies have been repaired or replaced.

### 4.4.2 HELIX ADJUSTMENT.

The Helix Adjust (R309) sets and calibrates the high voltage. The Helix Adjust (R309) is preset at the factory to provide optimum performance of the Model 560. Do not readjust this control to raise the voltage beyond that specified in the Test Data Sheet which is in the envelope at the rear of this manual while the instrument is in warranty.

If, after extended use, there is insufficient uniform rf gain across the band, it maybe possible to restore gain to the original spec level by readjustment of R309 within the limits shown in Table 4-4 during sweep mode, with the GAIN Control full On.

> CAUTION: Do not attempt to exceed the maximum Cathode Current (monitored by the front-panel meter) or the Helix Current trip-out level specified in Table 4-4.

### 4.4.3 ANODE VOLTAGE ADJUSTMENT. (Grid #2, 560A/561A) (Grid #1, 562A/563A)

The Anode Max. Control (R111 for the Model 560/561, R119 for the Model 562/563) is set at the factory to provide rated power output across the full band. Do not adjust this control to raise the voltage beyond that specified in the test data sheet which is in the envelope at the rear of this manual while the instrument is in warranty unless rf output falls below rated power.

If, after extended use, there is insufficent power output across the band, first check the helix voltage adjustment (Par. 4.4.2) for adequate gain and optimum response across the band. Then adjust R111 (560A/561A) or R119 (562A/563A) within the limits shown in Table 4-4 to restore power output to the original spec level, provided maximum Cathode current is not exceeded.

### 4.4.4 FOCUSING GRID BIAS ADJUST. (560A/561A only; Grid 1)

Adjustment of the Grid Bias Adjust potentiometer (R314) provides the regulation of the voltage supply which sets the focus voltage at Grid #1 of the TWT (560A/561A only.)

This control is preset at the factory and should not require readjustment unless components on PC Board 300 or the TWT have been replaced. This voltage should be adjusted to the value specified in the test data sheet in the envelope at the rear of this manual. If a helix voltage adjustment (Par. 4.4.2) is required to maintain an optimum gain curve across the band, try re-adjusting R314 within the limits shown in Table 4-4 to provide optimum response at any setting of the helix voltage.

4.5 REPLACEMENT OF THE TWT.

To replace the Traveling Wave Tube, use the following procedure:

a. Remove the top and bottom cover plates.

b. Disconnect all TWT connections from TB 901. (On units with Serial Nos. 60 and below, two connectors, P913 and J913, were used in place of Terminal Board TP901. On these units, disconnect P913 from J913).

c. Disconnect the RF connections from the TWT to the unit.

NOTE: If it is necessary to replace the RF input and output connectors and cables, use the cables supplied with the replacement tube. Drop the front panel of the unit and attach the new cables supplied with the replacement TWT.

d. Remove the four bolts securing the TWT to the unit chassis.

e. Remove the old tube.

f. Secure the new tube to the chassis.

NOTE: If the new tube comes supplied with a Winchester connector, remove the Connector; replace with terminal lugs and attach to TB901 as described in Fig. 4-3.

CAUTION!! Be sure proper tube to terminal connections are made on TB901.

g. After the replacement TWT is installed check Grid #1, Grid #2, and Helix voltages and adjust these to the voltages specified in the Tube Data Sheet supplied with the replacement TWT. (See pars. 4.4.2 through 4.4.4.)

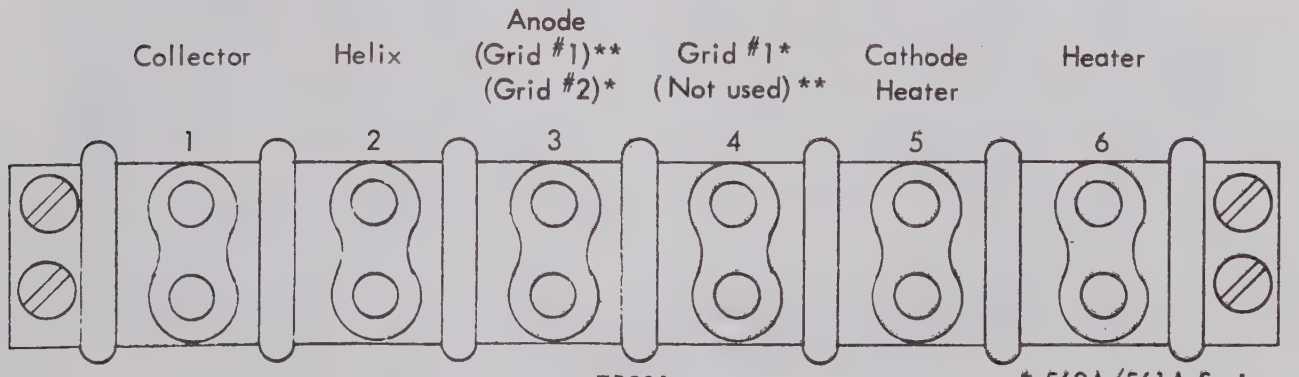



Figure 4-3

| Trouble Indication | Suggested Cause and Remedy |
|---|---|
| 1. Power Fuse (F901) blows. | a. Check primary power circuit for shorts.<br>b. Measure output impedance of the +20 and -70 V supplies (when de-energized). The value should be greater than 100 Ω for each supply. If not, trouble-shoot the low voltage PC Board.<br>c. Check low voltage rectifiers.<br>d. Check for shorts across transformer T902. |
| 2. High Voltage Fuse (F902) blows.<br>CAUTION: Remove thermal relay K903 to disable high voltage. | a. Measure low voltage supplies (dc check per table 4-2).<br>b. Check high voltage rectifiers.<br>c. Check the impedance of the high voltage and anode screen supplies for shorts.<br>d. Check for burned-out resistors on the high voltage PC Board (PC 300). |
| 3. Power Lite On with H.V. Lite On for only an instant.<br>The sequence of events leading to this problem is:<br>Power Lite is On<br>High Voltage Lite comes on 90 seconds later<br>Overcurrent Relay instantaneously trips out<br>High Voltage Lite goes out. | a. Check for magnetic sources near the unit.<br>b. Disconnect the Traveling Wave Tube after turning power off and waiting 2 minutes for voltage decay. Then turn power on and check for presence of high voltage. If there is high voltage, either the Anode or Helix voltages may not be regulating, causing that supply to assume raw maximum voltage. This indicates an open loop condition in the high voltage supply. Check the grid, anode, and helix supplies per table 4-2. If voltages are incorrect, check for disconnected wires to the control grid of one or more regulator tubes, and check to see whether the feedback resistors are intact.<br>c. If there is no high voltage, see if control tube V903 is conducting heavily by checking its control grid voltage (pin 1). The value should be approximately -1.5 volts. If the tube is conducting heavily, check the high voltage PC Board.<br>d. If the high voltage and anode supplies regulate simultaneously, check the TIME DELAY circuit and the relay contacts that feed the TIME DELAY circuit. (Be sure the time delay circuit is initially activated.) |

Table 4-3 is continued on page 4-8.

Model 560 Trouble Shooting Chart (Con't.)

| Trouble Indication | | Suggested Cause and Remedy |
|---|---|---|
| 4. No RF with high voltage and power ON. | a. | Check for proper Cathode current. |
| CAUTION: Make sure at least 1 mv of power is supplied to the RF INPUT. | b. | Check helix supply per Table 4-2. If improper supply voltage is obtained, check V901, V902, V903 and other components in the helix supply. |
| | c. | Check the traveling wave tube power connections. |
| | d. | If there is no Cathode current, check that all modulation inputs are removed. |
| | e. | With the modulation voltage disconnected, rotate the GAIN control from full On to full Off. If the GAIN control has little or not effect on cathode current, as seen on the panel meter, check the Anode voltage per Table 4-2. The voltage should agree with that given in the test data sheet in the envelope at the rear of this manual when the GAIN Control is fully CW, and decrease as the GAIN control is turned CCW. If it does not check out, check for defective components in the anode supply (PC 100). (In the 560A/561A, try replacing V904 and V906, and also check the Anode feedback network R925/C918.) |
| | f. | Check GAIN Control potentiometer R923. |
| | g. | Check anode rectifiers and screen supplies on PC 400. (Check raw supply voltages.) |
| | h. | Check TWT filament (TWT filament heater voltage and heater supply fuse F902). |
| 5. No modulation. | | Check the preamplifier circuitry, the wiring to the preamplifier circuit and the modulation input to the anode supply PC Board (PC 100). |
| 6. Power lite On but no high voltage after 90 seconds. | a. | Check thermal relay K903. |
| | b. | Check the high voltage interlock, S903. |

Table 4-4. TWT Voltage Adjustment Limits[t]

| MODEL | TUBE TYPE | FREQ. GHz | HELIX E MIN | HELIX E MAX | HELIX I MAX | GRID #1 E MIN | GRID #1 E MAX | GRID #2 E MIN | GRID #2 E MAX | CATHODE I MAX |
|---|---|---|---|---|---|---|---|---|---|---|
| 560A | M4268K | 1 - 2 | 635 | 685 | 8 ma | -60 | -25 | 350 | 550 | 45 ma |
| 561A | M4260K | 2 - 4 | 775 | 825 | 8 ma | -60 | -25 | 350 | 550 | 45 ma |
| SPEC | M4260KE | 1.7 - 4.2 | 775 | 825 | 8 ma | -60 | -25 | 350 | 550 | 45 ma |
| 562A | M4278K | 4 - 8 | 1875 | 2025 | 3.5 ma | 20 | 60 | NA | NA | 30 ma |
| SPEC | M4278KE | 3.7 - 8.3 | 1875 | 2025 | 3.5 ma | 20 | 60 | NA | NA | 30 ma |
| 563A | M4273K | 7.0-12.4 | 2375 | 2525 | 3.5 ma | 20 | 60 | NA | NA | 30 ma |

[t] Refer to the instrument test data sheet in the envelope at the rear of this manual for factory voltage settings which should be satisfactory during the warranty period.

To extend tube life after the warranty period, adjustment of Helix Voltage may be made to maintain an optimum output curve across the band. The Grid 2 Voltage (560A/561A) or the Grid 1 Voltage (562A/563A) may be adjusted to restore power output to specification level.

The Grid 1 voltage on the 560A/561A provides beam focusing and should not need to be adjusted from the data sheet value except in conjunction with a helix voltage readjustment to maintain an optimum output curve across the band. (See paragraphs 4.4.2 through 4.4.4.)

## 4.6 PERFORMANCE CHECK

This check should be made at least every six months or when repairs or replacements have been made.

> CAUTION: The signal source (Model 650 Plug-in) and ALL RF components (attenuators, etc.) in the test circuit must be for the same frequency band as the Model 560A Series unit being checked.

a. Connect the RF Output of the Alfred Model 650 Oscillator Plug-in Unit to the Model E100 Series Attenuator. Set the attenuator to provide 20 db attenuation. Set the Model 650 for full-band swept operation, Retrace ON, at the maximum power output that can be achieved with full-band leveling (UNLEVELED light off). Connect the output of the Model E100 Series attenuator to the power monitor (Model 8000/7051 Network Analyzer and Model 1403 Crystal Detector, or Model 431C Power Meter).

b. Observe the reading on the power monitor. Slowly adjust the E100 Series attenuator until the power monitor reads 0 dbm. This calibrates the RF output from the E100 Series attenuator. Disconnect this 0-dbm lead from the power meter and connect it instead to the RF INPUT of the Model 560A.

c. Connect the RF OUTPUT of the Model 560A through two pad attenuators providing 26 db attenuation to the power monitor.

NOTE: If a power meter is used, set the Model 650 Sweep control to SINGLE. Press the Sweep Trigger button to provide an indication on the power meter. If the 8000/7051 Network Analyzer is used, the Model 650 may be operated in a swept mode for continuous display.

d. Verify that the Model 560A power output remains greater than +4 dbm as read on the power monitor. (This, combined with the 26 db rf output attenuation equals the 30 db gain specification.)

e. Compare the output performance across the band with the factory performance graph given in the envelope at the rear of this manual. If considerably greater gain variation is experienced across the band, refer to par. 4.4.2 for a helix voltage check and adjustment.

f. If power output is low at any point within the band, refer to par. 4.4.3 and adjust the anode voltage as required to obtain the required power.

g. Repeat step d (and steps e and f as necessary) to insure that performance at all points within the band is within specifications.

# SECTION 5 - PARTS LIST

## CHASSIS AND PC BOARD ASSEMBLIES
## MODELS 560A/561A

| CIRCUIT REFERENCE | ALFRED PART NO. | DESCRIPTION | SCHEMATIC |
|---|---|---|---|
| 900 and 400 | | Main Chassis | D 900777 |
| PC 100 | 950831 | High Voltage Anode Supply PC Board | C 900778 |
| PC 200 | 901274 | Low Voltage Supplies PC Board | C 900682 |
| PC 300 | 950390 | Heater and High Voltage Supply PC Board | C 900683 |

| CIRCUIT REFERENCE | ALFRED PART NO. | DESCRIPTION | TRUE MFR. | TRUE MFR. PART NO. |
|---|---|---|---|---|
| | | CAPACITORS | | |
| C101 and C102 | 13-33 | 10 mf, Fixed, Elect., 100 v | 56289 | TE 1407 |
| C103 | 11-6 | 15 pf, Fixed, Mica, 5% | 72136 | DM15C150J |
| C104 and C105 | 12-3 | .01 mf, Fixed, Cer., 1000 v | 71590 | DD-1032 |
| C106* | 12-27 | 270 pf, Fixed, Cer., 1000 v | 71590 | DD271 |
| C107 and C108 | 12-3 | Same as C104 | | |
| C109 | 12-13 | .005 mf, Fixed, Cer., 500 v | 72982 | DD-1032 |
| C201 | 12-3 | .01 mf, Fixed, Cer., 1000 v | 71590 | DD-1032 |
| C202 | 12-34 | .1 mf, Fixed, Cer., 100 v | 91418 | BT 010 |
| C203 thru C205 | | Same as C201 | | |
| C206 | | Same as C202 | | |
| C207 | 13-40 | 100 mf, Fixed, Elect., 10 v | 56289 | TE 1119.3 |
| C301 | 12-34 | .1 mf, Fixed, Cer., 100 v | 91418 | BT 010 |
| C302 | | Not used | | |
| C303 | | Same as C301 | | |
| C401 | 12-3 | .01 mf, Fixed, Cer., 1000 v | 71590 | DD-1032 |
| C402 | 13-21 | 20 mf, Fixed, Elect., 250 v | 56289 | TVA 1508 |
| C403 and C404 | | Same as C401 | | |
| C405 and C406 | 13-42 | 10 mf, Fixed, Elect., 450 v | 56289 | TVA 1705 |
| C407 | | Same as C401 | | |
| C408 | | Same as C402 | | |
| C409 | 14-13 | 1 mf, Fixed, Paper, 200 v | 00656 | P8292 ZN13 |
| C410 | | Same as C402 | | |
| C901 and C902 | 12-28 | .001 mf, Fixed, Cer., 6000 v | 71590 | DD60-102 |
| C903 and C904 | 15-18 | 2 mf, Fixed, Paper, 2000 v | 99120 | LK 20-205 |
| C905 | 15-20 | 1 mf, Fixed, Paper, 3000 v | 99120 | LK 30-105 |
| C906 | 12-30 | 1.5 pf, Fixed, Cer., 6000 v | 56289 | 60-GA-V15 |
| C907 thru C911 | 12-3 | .01 mf, Fixed, Cer., 600 v | 71590 | DD-1032 |
| C912 and C913 | 12-34 | .1 mf, Fixed, Cer., 100 v | 91418 | BT 010 |
| C914 | 13-4 | 150 mf, Fixed, Elect., 150 v | 56289 | D 26978 |
| C915 | 13-36 | 100/100 mf, Fixed, Elect., 50 v | 56289 | TVL 2326 |
| C916 | 13-9 | 3000 mf, Fixed, Elect., 15 v | 37942 | WPO 42A |
| C917 | | Same as C914 | | |
| C918 | 12-43 | 20 pf, Fixed, Cer., 1000 v | 71590 | DD200 |
| C919 | 16-5 | .1 mf, Fixed, Plastic, 3000 v | 99120 | OF-30-104 |
| C920 and C921 | 12-28 | Same as C901 | | |
| | | DIODES | | |
| CR101 thru CR104 | 81-41 | 1N459 | 93332 | 1N459 |
| CR201 and CR202 | 81-41 | 1N459 | 93332 | 1N459 |
| CR203 | 81-75 | Zener, 1N823, 6.2 v | 04713 | 1N823 |
| CR301 and CR302 | 81-20 | DI-46/1N4385 | 12060 | DI-46 |
| CR303 and CR304 | 81-41 | 1N459 | 93332 | 1N459 |
| CR401 | 81-20 | DI-46/1N4385 | 12060 | DI-46 |
| CR402 | 81-96 | 1N973A | 04713 | 1N973A |
| CR403 thru CR409 | | Same as CR401 | | |
| CR 901A-D | 81-135 | MR 995A /EH 400 (4 each) | 04713 | MR 995A |
| CR902 and CR903 | | Not used | | |
| CR904 thru CR907 | 81-20 | DI-46/1N4385 | 12060 | D1-46 |
| CR908 | | | | |
| CR909 | 81-93 | MR322R | 04713 | MR 322R |
| CR910 | | Same as CR905 | | |
| CR911 | 81-125 | 1N4756A | 04713 | 1N4756 A |
| CR912 | 81-77 | 18199 | 99942 | 18199 |
| CR913 | | Not used | | |
| CR914 | 81-31 | Zener, 1N4758A | 04713 | 1N4758A |
| | | TRANSISTORS | | |
| Q101 thru Q106 | 81-114 | 2N3638A | 07263 | 2N3638A |
| Q201 | 81-51 | 2N404 | 02735 | 2N404 |
| Q202 | 81-72 | 2N699 | 96214 | 2N699 |
| Q203 and Q204 | | Same as Q201 | | |
| Q205 and Q206 | 81-73 | 2N706 | 02735 | 2N706 |
| Q207 | | Not used | | |
| Q208 | | Same as Q202 | | |
| Q209 and Q210 | | Same as Q201 | | |
| Q211 and Q212 | | Same as Q206 | | |
| Q301 | 81-72 | 2N699 | 96214 | 2N699 |
| Q302 and Q303 | 81-172 | 2N4248/2N404 | 07263 | 2N4248 |
| Q304 thru Q307 | 81-115 | 2N3565 | 07263 | 2N3565 |
| Q308 and Q309 | | Same as Q301 | | |
| Q401 and Q402 | 81-72 | 2N699 | 96214 | 2N699 |
| Q901 | 81-112 | 40251 | 02735 | 40251 |
| Q902 | 81-74 | 2N2147 | 02735 | 2N2147 |
| Q903 | 81-74 | 2N1540 | 04713 | 2N1540 |
| Q904 | 81-71 | 2N697 | 96214 | 2N697 |

# PARTS LIST - MODELS 560A/561A

| CIRCUIT REFERENCE | ALFRED PART NO. | DESCRIPTION | TRUE MFR. | TRUE MFR. PART NO. |
|---|---|---|---|---|
| | | RESISTORS | | |
| R101 | 41-560 K | 560 K, 1/2 w, Fixed, Comp, 10% | 01121 | EB 5641 |
| R102 | 56-7.5 K | 7.5 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-7.5 K |
| R103 | 56-14.7 K | 14.7 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-14.7 K |
| R104 | 56-1 K | 1 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-1 K |
| R105 | 56-19.6 K | 19.6 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-19.6 K |
| R106 | 56-16.2 K | 16.2 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-16.2 K |
| R107 | 56-3.83 K | 3.83 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-&C-TO-3.83 K |
| R108 | 41-56 K | 56 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 5631 |
| R109 | 41-1 M | 1 M, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1051 |
| R110 | 56-1.78 K | 1.78 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-1.78 K |
| R111 | 71-94 | 5 K, Variable, WW, 20 turn | 96791 | 2600-5 K |
| R112 and R113 | 56-10 K | 10 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-10 K |
| R114 * | 41-1 M | 1M, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1051 |
| R115 | 41-27 K | 27 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 2731 |
| R116 | 41-22 K | 22 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 2231 |
| R117 | 41-680 Ω | 680 Ω, 1/2 w, Fixed, Comp., 10% | 01121 | EB 6811 |
| R118 | 41-4.7 K | 4.7 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 4721 |
| R119 | 41-10 K | 10 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1031 |
| R120 | 41-18 K | 18 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1831 |
| R121 * | 41-1 K | 1 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1021 |
| R122 | 41-8.2 K | 8.2 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 8221 |
| R123 | | Same as R119 | | |
| R124 | 41-2.2 K | 2.2 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 2221 |
| R201 | 56-5.62 K | 5.62 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-5.62 K |
| R202 | 56-1.96 K | 1.96 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-1.96 K |
| R203 | 56-7.50 K | 7.50 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-7.50 K |
| R204 | 56-10 K | 10 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-10 K |
| R205 | 41-8.2 K | 8.2 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 8221 |
| R206 | 42-1 K | 1 K, 1 w, Fixed, Comp., 10% | 01121 | GB 1021 |
| R207 | 41-1.5 K | 1.5 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1521 |
| R208 | 41-10 K | 10 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1031 |
| R209 | 41-22 K | 22 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 2231 |
| R210 | 41-22 Ω | 22 Ω, 1/2 w, Fixed, Comp., 10% | 01121 | EB 2201 |
| R211 | 41-68 K | 68 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 6831 |
| R212 | 41-22 K | 22 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 2231 |
| R213 | 56-16.2 K | 16.2 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-16.2 K |
| R214 | 56-4.64 K | 4.64 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-4.64 K |
| R215 | 44-1.0 Ω | 1.0 Ω, 1/2 w, Fixed, Comp., 5% | 75042 | BWH-1.0 Ω |
| R216 | 43-1 K | 1 K, 2 w, Fixed, Comp., 10% | 01121 | HB 1021 |
| R217 | 41-39 K | 39 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 3931 |
| R218 | 41-1.5 K | 1.5 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1521 |
| R219 and R220 | 56-2.61 K | 2.61 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-2.61 K |
| R221 | 71-91 | 500 Ω, Variable, 20 turn | 96791 | 2600-500 Ω |
| R222 | 56-499 Ω | 499 Ω, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-499 Ω |
| R223 | 56-100 K | 100 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-100 K |
| R224 | | Same as R210 | | |
| R225 | | Same as R201 | | |
| R226 | | Same as R223 | | |
| R227 | 41-100 Ω | 100 Ω, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1011 |
| R228 | 42-8.2 K | 8.2 K, 1 w, Fixed, Comp., 10% | 01121 | GB 8221 |
| R229 | | Same as R215 | | |
| R301 | 41-56 Ω | 56 Ω, 1/2 w, Fixed, comp.,10% (S/N 491 & above) | 01121 | EB 5601 |
| | 41-100 Ω | 100 Ω (S/N 490 & below) | | |
| R302 | 56-1.78K | 1.78K, 1/2 w, Fixed, comp.,1% (S/N 491 & above) | 19701 | MF-7C-TO-1.78K |
| | 56-1.96 K | 1.96K (S/N 490 & below) | | |
| R303 | 41-390 Ω | 390 Ω, 1/2 w, Fixed, Comp., 10% | 01121 | EB 3911 |
| R304 | 56-3.83 K | 3.83 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-3.83 K |
| R305 | 56-7.50 K | 7.50 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-7.50 K |
| R306 | 56-1.02 K | 1.02 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TP-1.02 K |
| R307 | 56-19.6 K | 19.6 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-19.6 K |
| R308 | 56-82.5 K | 82.5 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-82.5 K |
| R309 | 71-93 | 10 K, Variable, 20 turn | 96791 | 2600-20 K |
| R310 | 41-3.3 M | 3.3 M, 1/2 w, Fixed, Comp., 10% | 01121 | EB 3351 |
| R311 | 41-22 K | 22 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 2231 |
| R312 | | Same as R303 | | |
| R313 | 41-39 K | 39 K, 1/2 w, Fixed, Comp. | 01121 | EB 3931 |
| R314 | 71-92 | 20 K, Variable, 20 turn | 96791 | 2600-20 K |
| R315 | | Same as R310 | | |

| CIRCUIT REFERENCE | ALFRED PART NO. | DESCRIPTION | TRUE MFR. | TRUE MFR. PART NO. |
|---|---|---|---|---|
| | | RESISTORS (CON'T) | | |
| R316 | 41-56 K | 56 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 5631 |
| R317 | 56-2.37 K | 2.37 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-2.37 K |
| R318 | 56-1.33 K | 1.33 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-1.33 K |
| R319 | 56-15 K | 15 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-15 K |
| R320 | | Same as R302 | | |
| R321 | 56-14.7K | 14.7K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-14.7K |
| R401 | 43-2.2 K | 2 .2 K, 2 w, Fixed, Comp., 10% | 01121 | HB 2221 |
| R402 | 43-15 K | 15 K, 2 w, Fixed, Comp., 10% | 01121 | HB 1531 |
| R403 | 41-12 K | 12 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1231 |
| R404 | 41-33 K | 33 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 3331 |
| R405 * | 56-3.16 K | Factory Select nom. value 3.16 K | 19701 | MF-7C-TO-3.16 K |
| R406 | 41-47 K | 47 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 4731 |
| R407 and R408 | 42-3.3 M | 3.3 M, 1 w, Fixed, Comp., 10% | 01121 | GB 3351 |
| R409 | 43-10 K | 10 K, 2 w, Fixed, Comp., 10% | 01121 | HB 1031 |
| R410 | 41-15 K | 15 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1531 |
| R901 | 61-22 | 8 M, 5000 v, Fixed | 75042 | MVG-13 |
| R902 | | Not used | | |
| R903 | 42-1 K | 1 K, 1 w, Fixed, Comp., 10% | 01121 | GB 1021 |
| R904 | 43-68 K | 68 K, 2 w, Fixed, Comp., 10% | 01121 | HB 6831 |
| R905 | | Same as R903 | | |
| R906 and R907 | 41-1 K | 1 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1021 |
| R908 | 41-47 Ω | 47 Ω, 1/2 w, Fixed, Comp., 10% | 01121 | EB 4701 |
| R909 | | Same as R906 | | |
| R910 | 42-1.8 K | 1.8 K, 1 w, Fixed, Comp.,10% | 01121 | GB 1821 |
| R911 | | Same as R906 | | |
| R912 | | Same as R908 | | |
| R913 | 41-10 Ω | 10 Ω, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1001 |
| R914 | | Not used | | |
| R915 | 43-68 K | 68 K, 2 w, Fixed, Comp., 10% | 01121 | HB 6831 |
| R916 | | Same as R913 | | |
| R917 | 41-22 Ω | 22 Ω, 1/2 w, Fixed, Comp., 10% | 01121 | EB 2201 |
| R918 | 43-68 K | 68 K, 2 w, Fixed, Comp., 10% | 01121 | HB 6831 |
| R919 | 41-33 Ω | 33 Ω, 1/2 w, Fixed, comp., 10% (S/N 491 & above) | 01121 | EB 3301 |
| | | Same as R917 (S/N 490 & below) | | |
| R920 | 43-27 Ω | 27 Ω, 2 w, Fixed, Comp., 10% | 01121 | HB 2701 |
| R921 | 63-8 | 25 Ω, 20 w, Fixed, WW | 35434 | C20-25 |
| R922 | 55-42 | 1.05 Ω, 1/2 w, Fixed, WW, 1% | 91827 | G2-1.05 Ω |
| R923 | 71-41 | 5 K, Variable | 44655 | CU 5021 |
| | | NOTE: R924 thru R932 are mounted on a ceramic board above the fuse holder. | | |
| R924 | 41-1 K | 1 K, 1/2 w, fixed, Comp., 10% | 01121 | EB 1021 |
| R925 | 62-24 | 55 K, 10 w, Fixed, WW, 3% | 91637 | RS-10-55 K |
| R926* | 52-464K | 464K, 1 w, Fixed, MF, 1% | 19701 | MFS-1-464K |
| R927* | 56-464K | 464K, 1 w, Fixed, MF 1% | 19701 | MFS-1-464K |
| | 56-348K | 348K, 1/2 w, Fixed, MF, 1% (560AC only) | 19701 | MF-7C-TO-348K |
| R928* | 56-100K | 100K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-100K |
| R929* thru R931* | | Not used in Model 560A | | |
| | | Not used | | |
| R932 | 41-39 Ω | 39 Ω, 1/2 w, Fixed, comp., 10% (S/N 181 & above) | 01121 | EB 3901 |
| | 41-68 Ω | 68 Ω (S/N 180 & below) | | |
| R933 | 41-27 Ω | 27 Ω, 1/2 w, Fixed, comp., 10% (S/N 181 & above) | 01121 | EB 2701 |
| | 41-100 Ω | 100 Ω, 1/2 w, Fixed, comp., 10% 10% (S/N 180 & below) | | |
| R934 and R935 | | Not used | | |
| R936 | 42-18 K | 18 K, 1 w, Fixed, Comp., 10% | 01121 | GB 1831 |
| R937 | 41-4.7 K | 4.7 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 4721 |
| R938 | 44-1.5 Ω | 1.5 Ω, 1/2 w, Fixed, Comp., 5% | 75042 | BWH-1.5 Ω |
| | | LAMPS | | |
| DS401 | 126-1 | Lamp, Neon, NE-2 | 08806 | NE2 |
| DS901 and DS902 | 126-9 | Indicator Panel | 95263 | 32-1111T |
| DS903 | 126-1 | Lamp, Neon, NE-2 | 08806 | NE2 |
| | | FUSES | | |
| F901 | 121-3 | Fuse, 3A, Type 3AG | 75915 | 312003 |
| F902 | 121-14 | Fuse, 2 A, slo-blo, Type 3AG | 75915 | 313002 |

*Factory Select

# PARTS LIST - 560A/561A

| CIRCUIT REFERENCE | ALFRED PART NO. | DESCRIPTION | TRUE MFR. | TRUE MFR. PART NO. |
|---|---|---|---|---|
| | | **RELAYS** | | |
| K901 | 106-3 | DPDT, 6 v | 77342 | KA 1467 |
| K902 | 106-19 | 3PDT, 6 v | 77342 | KA 14AY |
| K903 | 106-27 | Time delay, 90 sec. | 73445 | 6N060T |
| K904 and K905 | 106-24 | SPDT, RS5D-10K | 77342 | RS-5D-10K |
| K906 | 106-13 | DPDT, 6 v, DC | 77342 | PW 5257-1 |
| | | **INDUCTORS** | | |
| L101 and L102 | 92-25 | 200 mh, choke, RF | 76487 | 9210-90 |
| L301 | 92-19 | 100 mh, coil, RF, 10% | 71895 | 1025-68 |
| | | **METERS** | | |
| M901 | 86-53 | 0 - 1 ma, 50 Ω, fullscale, 2% | 06555 | E-25E |
| | | **SWITCHES** | | |
| S901 | 101-3 | Toggle | 04009 | 81024 GB |
| S902 | 102-128 | Lever | 76854 | 233785-187-531F1-ISSA |
| S903 | 101-17 | Interlock | 01963 | E33-20A |
| S904 | 101-22 | Air Flow Interlock | 01963 | E51-07B |
| | | **TRANSFORMERS** | | |
| T901 | 91-191 | AE950346C | 03782 | 950346 |
| T902 | 91-194 | AE950380C | 03782 | 950380 |
| T903 | 91-192 | AE950354C | 03782 | 950354 |
| T904 | 91-193 | AE950378C | 03782 | 950378 |
| | | **VACUUM TUBES** | | |
| V901 | 111-0A2 | Tube, electron, OA2 | 02735 | OA2 |
| V902 | 111-8068 | Tube, electron, 8068 | 33173 | 8068 |
| V903 | 111-7239 | Tube, electron, 7239 | 33173 | 7239 |
| V904 | 111-6GT5 | Tube, electron, 6GT5 | 02735 | 6GT5 |
| V905 | TRAVELING WAVE TUBES FOR MODELS 560A/561A | | | |
| 560A | 112-051 | TWT SPEC CONT. M-4268K | 03782 | 112-051 |
| 561A | 112-049 | TWT SPEC CONT. M-4260K | 03782 | 112-049 |
| V906 | | Same as V904 | | |
| | | **BLOWER ASSEMBLY** | | |
| B901 | 201-11 | Blower | 53404 | 3-90-8520 |

# SECTION 5 - PARTS LIST

## CHASSIS AND PC BOARD ASSEMBLIES
## MODELS 562A/563A

| CIRCUIT REFERENCE | ALFRED PART NO. | DESCRIPTION | SCHEMATIC |
|---|---|---|---|
| 900 and 400 | | Main Chassis | D 900779 |
| PC 100 | 901463 | Low Voltage Anode Supply PC Board | C 900864 |
| PC 200 | 901274 | Low Voltage Supplies PC Board | C 900682 |
| PC 300 | 950390 | Heater and High Voltage Supply PC Board | C 900683 |

| CIRCUIT REFERENCE | ALFRED PART NO. | DESCRIPTION | TRUE MFR. | TRUE MFR. PART NO. |
|---|---|---|---|---|
| | | CAPACITORS | | |
| C101 and C102 | 13-33 | 10 mf, Fixed, Elect., 100 v | 56289 | TE 1407 |
| C103 | 14-13 | 1 mf, Fixed, Paper, 200 v | 00656 | P8292ZN13 |
| C104 | 12-41 | 10 pf, Fixed, Cer., 1000 v | 71590 | DD 100 |
| C105 | 12-3 | .01 mf, Fixed, Cer., 1000 v, | 71590 | DD-1032 |
| C106 | 12-31 | .022mf, fixed, elect.,1KV | 56289 | 5-GAB-S22 |
| C107 | 12-13 | .005 mf, Fixed, Cer., 500 v | 71982 | 811-Z5V-502T |
| C201 | 12-3 | .01 mf, Fixed, Cer., 1000 v | 71590 | DD-1032 |
| C202 | 12-34 | .1 mf, Fixed, Cer., 100 v | 91418 | BT 010 |
| C203 thru C205 | 12-3 | .01 mf, Fixed, Cer., 1000 v | 71590 | DD-1032 |
| C206 | | Same as C202 | | |
| C207 | 13-40 | 100 mf, Fixed, Cer., 10 v | 56289 | TE 1119.3 |
| C301 | 12-34 | .1 mf, Fixed, Cer., 100 v, | 91418 | BT 010 |
| C302 | | Not used | | |
| C303 | | Same as C301 | | |
| C401 | 12-3 | .01 mf, Fixed, Cer., 1000 v | 71590 | DD-1032 |
| C402 | 13-21 | 20 mf, Fixed, Elect., 250 v | 56289 | TVA 1508 |
| C403 thru C407 | | Not used | | |
| C408 | 13-21 | 20 mf, Fixed, Elect., 250 v | 56289 | TVA 1508 |
| C409 | | Not used | | |
| C410 | 13-21 | 20 mf, Fixed, Elect., 250 v | 56289 | TVA 1508 |
| C901 and C902 | 12-28 | .001 mf, Fixed, Cer., 6000 v | 71590 | DD60-102 |
| C903 and C904 | 15-18 | 2 mf, Fixed, Paper, 2000 v | 99120 | LK 20-205 |
| C905 | 15-20 | 1 mf, Fixed, Paper, 3000 v | 99120 | LK 30-105 |
| C906 | 12-30 | 1.5 pf, Fixed, Cer., 6000 v | 56289 | 60-GA-V15 |
| C907 | | Not used | | |
| C908 thru C911 | 12-3 | .01 mf, Fixed, Cer., 1000 v | 71590 | DD-1032 |
| C912 and C913 | 12-34 | .1 mf, Fixed, Cer., 100 v | 91418 | BT 010 |
| C914 | 13-4 | 150 mf, Fixed, Elect., 150 v | 56289 | TVA 1422 |
| C915 | 13-36 | 100/100 mf, Fixed, Elect., 50 v | 56289 | TVL 2326 |
| C916 | 13-9 | 3000 mf, Fixed, Elect., 15 v | 37942 | WPO 42A |
| C917 | 13-4 | Same as C914 | | |
| C918 | | Not used | | |
| C919 | 16-5 | .1 mf, Fixed, Plastic, 3000 v | 99120 | OF-30-104 |
| | | DIODES | | |
| CR101 thru CR108 | 81-41 | 1N459 | 93332 | 1N459 |
| CR201 and CR202 | 81-41 | 1N459 | 93332 | 1N459 |
| CR203 | 81-75 | Zener, 1N823 (6.2 v) | 04713 | 1N823 |
| CR301 and CR302 | 81-20 | DI-46/1N4385 | 12060 | DI-46 |
| CR303 and CR304 | 81-41 | 1N459 | 93332 | 1N459 |
| CR401 | 81-20 | DI-46/1N4385 | 12060 | DI-46 |
| CR402 | 81-57 | Zener, 1/4 M15Z10 | 04713 | 1/4 M15Z10 |
| CR403 and CR404 | | Not used | | |
| CR405 | | Same as CR401 | | |
| CR406 thru CR408 | | Not used | | |
| CR409 | | Same as CR401 | | |
| CR901 A/B | 81-135 | MR995A/DI-1154 | 04713 | MR995A |
| CR902 and CR903 | | Not used | | |
| CR904 thru CR907 | 81-20 | DI-46/1N4385 | 12060 | DI-46 |
| CR908 and CR909 | 81-93 | MR322R | 04713 | MR322R |
| CR910 | | Same as CR904 | | |
| CR911 | 81-125 | 1N4756 A | 04713 | 1N4756A |
| CR912 | 81-77 | Zener 18199 | 01281 | 18199 |
| CR913 thru CR918 | | Not used | | |
| CR919 and CR920 | 81-41 | 1N459 | 93332 | 1N459 |
| | | TRANSISTORS | | |
| Q101 thru Q103 | 81-114 | 2N3638A | 07263 | 3638A |
| Q104 | 81-72 | 2N699 | 96214 | 2N699 |
| Q105 | | Same as Q101 | | |
| Q106 | 81-129 | 2N3645 | 07263 | 2N3645 |
| Q107 | 81-71 | 2N697 | 96214 | 2N697 |
| Q108 and Q109 | | Same as Q104 | | |
| Q201 | 81-51 | 2N404 | 02735 | 2N404 |
| Q202 | 81-72 | 2N699 | 96214 | 2N699 |
| Q293 and Q204 | | Same as Q201 | | |
| Q205 and Q206 | 81-73 | 2N706 | 02735 | 2N706 |
| Q207 | | Not used | | |
| Q208 | | Same as Q202 | | |
| Q209 and Q210 | | Same as Q201 | | |
| Q211 and Q212 | | Same as Q205 | | |
| Q301 | 81-72 | 2N699 | 96214 | 2N699 |
| Q302 and Q303 | 81-172 | 2N4248 (S/N 1543 & above)<br>2N404 (S/N 1542 & below) | 07263<br>02735 | 2N4248<br>2N404 |
| Q304 thru Q307 | 81-115 | 2N3565 | 07263 | 2N3565 |
| Q308 and Q309 | | Same as Q301 | | |



*Factory Select

# PARTS LIST - 562A/563A

| CIRCUIT REFERENCE | ALFRED PART NO. | DESCRIPTION | TRUE MFR. | TRUE MFR. PART NO. |
|---|---|---|---|---|
| | | TRANSISTORS (CON'T) | | |
| Q401 and Q402 | 81-72 | 2N699 | 96214 | 2N699 |
| Q901 | 81-112 | 40251 | 02735 | 40251 |
| Q902 | 81-86 | 2N2147 | 02735 | 2N2147 |
| Q903 | 81-74 | 2N1540 | 04713 | 2N1540 |
| Q904 | 81-71 | 2N697 | 96214 | 2N697 |
| | | RESISTORS | | |
| R101 | 56-7.5 K | 7.5 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-7.5 K |
| R102 | 56-1 K | 1 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-1 K |
| R103 | 41-560 K | 560 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 5641 |
| R104 | 56-19.6 K | 19.6 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-19.6 K |
| R105 | 56-14.7 K | 14.7 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-14.7 K |
| R106 | 56-3.83 K | 3.83 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-3.83 K |
| R107 | 56-16.2 K | 16.2 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-16.2 K |
| R108 | 56-31.6 K | 31.6 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-31.6 K |
| R109 | 41-56 K | 56 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 5631 |
| R110 | 41-100 K | 100 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1041 |
| R111 | 56-46.4 K | 46.4 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-46.4 K |
| R112 | | Same as R110 | | |
| R113 | 43-2.2 K | 2.2 K, 2 w, Fixed, Comp., 10% | 01121 | HB 2221 |
| R114 | | Same as R110 | | |
| R115 | | Same as R103 | | |
| R116 | 56-26.1 K | 26.1 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-26.1 K |
| R117 | 56-53.6 K | 53.6 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-53.6 K |
| R118 | 41-15 K | 15 K, 1/2 w, Fixed, Comp., 10% | 001121 | EB 1531 |
| R119 | 71-93 | 10 K, Variable, 20 turn | 96791 | 2600 - 10 K |
| R120 | 56-1.96 K | 1.96 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-1.96 K |
| R121 | 41-10 K | 10 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1031 |
| R122 * | 41-3.3 M | 3.3 M, 1/2 w, Fixed, Comp., 10% | 01121 | EB 3351 |
| R123 | 41-47 K | 47 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 4731 |
| R124 | 41-10 Ω | 10 Ω, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1001 |
| R125 | 43-3.3 K | 3.3 K, 2 w, Fixed, Comp., 10% | 01121 | GB 3321 |
| R126 | 56-10 K | 10 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-10 K |
| R127 | 56-4.99 K | 4.99 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-4.99 K |
| R128 | 56-52.3 K | 52.3 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-52.3 K |
| R129 | | Same as R121 | | |
| R130 | 43-15 K | 15 K, 2 w, Fixed, Comp., 10% | 01121 | GB 1531 |
| R131 | 41-100 Ω | 100 Ω, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1011 |
| R132 | | Same as R123 | | |
| R201 | 56-5.62 K | 5.62 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-5.62 K |
| R202 | 56-1.96 K | 1.96 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-1.96 K |
| R203 | 56-7.50 K | 7.50 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-7.50 K |
| R204 | 56-10 K | 10 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-10 K |
| R205 | 41-8.2 K | 8.2 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 8221 |
| R206 | 42-1 K | 1 K, 1 w, Fixed, Comp., 10% | 01121 | GB 1021 |
| R207 | 41-1.5 K | 1.5 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1521 |
| R208 | 41-10 K | 10 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1031 |
| R209 | 41-22 K | 22 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 2231 |
| R210 | 41-22 Ω | 22 Ω, 1/2 w, Fixed, Comp., 10% | 01121 | EB 2201 |
| R211 | 41-68 K | 68 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 6831 |
| R212 | | Same as R209 | | |
| R213 | 56-16.2 K | 16.2 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-16.2 K |
| R214 | 56-4.64 K | 4.64 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-4.64 K |
| R215 | 44-1.0 Ω | 1.0 Ω, 1/2 w, Fixed, Comp., 5% | 75042 | BWH - 1.0 Ω |
| R216 | 43-1 K * | 1 K, 2 w, Fixed, Comp., 10% | 01121 | HB 1021 |
| R217 | 41-39 K | 39 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 3931 |
| R218 | | Same as R207 | | |
| R219 and R220 | 56-2.61 K | 2.61 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-2.61 K |
| R221 | 71-91 | 500 Ω, Variable, 20 turn | 96791 | 2600 - 500 Ω |
| R222 | 56-499 Ω | 499 Ω, 1/2 w, Fixed, MF | 19701 | MF-7C-TO-499 Ω |
| R223 | 56-100 K | 100 K, 1/2 w, Fixed, MF | 19701 | MF-7C-TO-100 K |
| R224 | | Same as R210 | | |
| R225 | | Same as R201 | | |
| R226 | | Same as R223 | | |
| R227 | 41-100 Ω | 100 Ω, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1011 |
| R228 | 42-8.2 K | 8.2 K, 1 w, Fixed, Comp., 10% | 01121 | GB 8221 |
| R229 | | Same as R215 | | |

| CIRCUIT REFERENCE | ALFRED PART NO. | DESCRIPTION | TRUE MFR. | TRUE MFR. PART NO. |
|---|---|---|---|---|
| | | RESISTORS (CON'T) | | |
| R301 | 41-56 Ω | 56 Ω, 1/2 w, Fixed, comp., 10% (S/N 1543 & above) | 01121 | EB 5601 |
| | 41-100 Ω | 100 Ω (S/N 1542 & below) | | |
| R302 | 56-1.78K | 1.78K, 1/2 w, Fixed, MF, 1% (S/N 1543 & above) | 19701 | MF-7C-TO-1.78K |
| | 56-1.96K | 1.96K (S/N 1542 & below) | | |
| R303 | 41-390 Ω | 390 Ω, 1/2 w, Fixed, Comp., 10% | 01121 | EB 3911 |
| R304 | 56-3.83 K | 3.83 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-3.83 K |
| R305 | 56-7.50 K | 7.50 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-7.50 K |
| R306 | 56-1.02 K | 1.02 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-1.02 K |
| R307 | 56-19.6 K | 19.6 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-19.6 K |
| R308 | 56-82.5 K | 82.5 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-82.5 K |
| R309 | 71-93 | 10 K, Variable 20 turn | 96791 | 2600-10 K |
| R310 | 41-3.3 M | 3.3 M, 1/2 w, Fixed, Comp., 10% | 01121 | EB 3351 |
| R311 | 41-22 K | 22 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 2231 |
| R312 | | Same as R303 | | |
| R313 | 41-39 K | 39 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 3931 |
| R314 | 71-92 | 20 K, Variable, 20 turn | 96791 | 2600 - 20 K |
| R315 | | Same as R310 | | |
| R316 | 41-56 K | 56 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 5631 |
| R317 | 56-2.37 K | 2.37 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-2.37 K |
| R318 | 56-1.33 K | 1.33 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-1.33 K |
| R319 | 56-15 K | 15 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-15 K |
| R320 | | Same as R302 | | |
| R321 | 56-14.7 K | 14.7 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-14.7 K |
| R401 | 43-2.2 K | 2.2 K, 2 w, Fixed, Comp., 10% | 01121 | HB 2221 |
| R402 | 43-15 K | 15 K, 2 w, Fixed, Comp., 10% | 01121 | HB 1531 |
| R403 | 41-12 K | 12 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1231 |
| R404 | 41-33 K | 33 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 3331 |
| R405 * | 56-3.83 K | 3.83 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-3.83 K |
| R406 | 41-47 K | 47 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 4731 |
| R407 and R408 | | Not used | | |
| R409 | | Same as R401 | | |
| R410 | 41-100 Ω | 100 Ω, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1011 |
| R901 and R902 | 61-22 | 8 M, 5000 v, Fixed | 75042 | MVG-13 |
| R903 | 42-1 K | 1 K, 1 w, Fixed, Comp., 10% | 01121 | GB 4221 |
| R904 | 43-68 K | 68 K, 2 w, Fixed, Comp., 10% | 01121 | HB 6831 |
| R905 | | Same as R903 | | |
| R906 and R907 | 41-1 K | 1 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1021 |
| R908 thru R912 | | Not used | | |
| R913 | 41-10 Ω | 10 Ω, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1001 |
| R914 | | Not used | | |
| R915 | 43-68 K | 68 K, 2 w, Fixed, Comp., 10% | 01121 | HB 6831 |
| R916 | | Same as R913 | | |
| R917 | 41-22 Ω | 22 Ω, 1/2 w, Fixed, Comp., 10% | 01121 | EB 2201 |
| R918 | 43-68 K | 68 K, 2 w, Fixed, Comp., 10% | 01121 | HB 6831 |
| R919 | 41-33 Ω | 33 Ω (S/N 1543 & above) | 01121 | EB 3301 |
| | 41-22 Ω | 22 Ω, (S/N 1542 & below) | | |
| R920 | 43-27 Ω | 27 Ω, 2 w, Fixed, comp., 10% | 01121 | HB 2701 |
| R921 | 63-8 | 25 Ω, 20 w, Fixed, WW | 35434 | C20 - 25 |
| R922 | 55-42 | 1.05 Ω, 1/2 w, Fixed, WW, 1% | 91827 | G2-1.05 Ω |
| R923 | 71-41 | 5 K, Variable, | 44655 | CU 5021 |
| | | NOTE: R924 thru R932 are mounted on a ceramic board above the fuse holder. | | |
| R924 | 41-1 K | 1 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1021 |
| R925 | 62-24 | 55 K, 10 w, Fixed, WW, 3% | 91637 | RS-10-55 K |
| R926 | 52-464 K | 464 K, 1 w, Fixed, MF, 1% | 19701 | MFS-1-T2-464 K |
| R927 | 52-464 K | 464 K, 1 w, Fixed, MF, 1% | 19701 | MFS-1-T2-464 K |
| R928 | 52-464 K | 464 K, 1 w, Fixed, MF, 1% | 19701 | MFS-1-T2-464 K |
| R929 | 52-464 K | 464 K, - w, Fixed, MF, 1% | 19701 | MFS-1-T2-464 K |
| R930 | 52-464 K | 464 K, 1 w, Fixed, MF, 1% | 19701 | MFS-1-T2-464 K |
| R931 | 56-118 K | 118 K, 1/2 w, Fixed, MF, 10% | 19701 | MF-7C-TO-118 K |
| R931 ** | 52-464 K | (for 563AC only) 464 K, 1 w, Fixed, MF, 1% | 19701 | MFS-1-T2-464 K |
| R932 | 41-68 Ω | 68 Ω, 1/2 w, Fixed, Comp., 10% | 01121 | EB 6801 |
| R932 ** | 56-215 K | 215 K, 1/2 w, Fixed, MF, 1% | 19701 | MF-7C-TO-215 K |
| R933 | 41-27 Ω | 27 Ω, 1/2 w, Fixed, Comp., 10% (S/N 181 & above) | 01121 | EB 2701 |
| | 41-100 Ω | 100 Ω (S/N 180 & below) | | |
| R934 | 41-39 Ω | 39 Ω, 1/2 w, Fixed, Comp., 10% (S/N 181 & above) | 01121 | EB 3901 |
| | 41-68 Ω | 68 Ω (S/N 180 & below) | | |
| R935 | 41-10 K | 10 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 1031 |
| R936 | | Not used | | |
| R937 | 41-4.7 K | 4.7 K, 1/2 w, Fixed, Comp., 10% | 01121 | EB 4721 |
| R938 | 44-1.5 Ω | 1.5 Ω, 1/2 w, Fixed, Comp., 5% | 75042 | BWH-1.5 Ω |

# PARTS LIST - 562A/563A

| CIRCUIT REFERENCE | ALFRED PART NO. | DESCRIPTION | TRUE MFR. | TRUE MFR. PART NO. |
|---|---|---|---|---|
| | | **LAMPS** | | |
| DS401 | 126-1 | Lamp, Neon NE-2 | 08806 | NE-2 |
| DS901 and DS902 | 126-9 | Indicator Panel | 95263 | 32-1111T |
| | | **FUSES** | | |
| F901 | 121-3 | Fuse, 3 A Type 3AG | 75915 | 312003 |
| F902 | 121-14 | Fuse, 2 A, Type 3AG slo-blo | 75915 | 313002 |
| | | **RELAYS** | | |
| K901 | 106-3 | DPDT, 6 v, AC | 77342 | KA 1467 |
| K902 | 106-19 | 3PDT, 6 v | 77342 | KA 14AY |
| K903 | 106-27 | Time Delay, 90 sec. | 73445 | 6N060T |
| K904 and K905 | 106-24 | SPDT, RS5D-10 K | 77342 | RS-5D-10K |
| K906 | 106-13 | DPDT, 6 v, DC | 77342 | PW 5257-1 |
| | | **INDUCTORS** | | |
| L301 | 92-19 | 100 mf, coil, RF, 10% | 71895 | 1025-68 |
| | | **METERS** | | |
| M901 | 86-53 | 0 - 1 ma, 50 Ω, full scale, 2% | 06555 | E-25E |
| | | **SWITCHES** | | |
| S901 | 101-3 | Toggle | 04009 | 81024 GB |
| S902 | 102-128 | Lever | 76854 | 233785-187-53F1, ISS A |
| S903 | 101-17 | Interlock | 01963 | E33-20A |
| S904 | 101-22 | Airflow Interlock | 01963 | E51-07B |
| | | **TRANSFORMERS** | | |
| T901 | 91-191 | AE 950346C | 03782 | 950346 |
| T902 | 91-194 | AE 950380C | 03782 | 950380 |
| T903 | 91-192 | AE 950354C | 03782 | 950354 |
| T904 | 91-193 | AE 950378C | 03782 | 950378 |
| | | **VACUUM TUBES** | | |
| V901 | 111-OA2 | Tube, electron, OA2 | 02735 | OA2 |
| V902 | 111-8068 | Tube, electron, 8068 | 33173 | 8068 |
| V903 | 111-7239 | Tube, electron, 7239 | 33173 | 7239 |
| V905 | TRAVELING WAVE TUBES FOR MODELS 562A/563A | | | |
| 562A | 112-053 | TWT SPEC. CONT. M-4278K | 03782 | 112-053 |
| 563A | 112-052 | TWT SPEC. CONT. M-4273K | 03782 | 112-052 |
| | | **BLOWER ASSEMBLY** | | |
| B901 | 201-11 | Blower | 53404 | 3-90-8520 |

# FEDERAL SUPPLY CODE FOR TRUE MANUFACTURERS

| FMC Number | Full Name and Address of Vendor |
|---|---|
| 00656 | Aerovox Corporation, 740 Belleville Ave., New Bedford, Mass. |
| 00686 | Film Capacitors, Inc., 100 East 8th Street, Pabsaic, N.J. |
| 00816 | Hughes Aircraft Co., Vacuum Div., 500 Superior Ave., Newport Beach, Calif. |
| 00853 | Sangamo Electric Co., P.O. Box 128, Pickens, S.C. |
| 00866 | Goe Engineering Co., 219-21 S. Mednik Ave., Los Angeles, Calif. |
| 01121 | Allen Bradley Co., 136 W. Greenfield Ave., Milwaukee, Wisc. |
| 01281 | Pacific Semiconductor Co., 10451 W. Jefferson Blvd., Culver City, Calif. |
| 01456 | Microwave Development Laboratories, 87 Crescent Road, Needham Heights, Mass. |
| 01963 | Cherry Electrical Products Corp., Box 439, Highland Park, Ill. |
| 02111 | Spectrol Electric Corporation, 17070 E. Gale Ave., City of Industry, Calif. 91745 |
| 03508 | G.E. Semiconductor, Electronics Park, Syracuse, N.Y., 13201 |
| 03565 | Dayton Electronic Products Co., 117 E. Helena St., Dayton, Ohio |
| 03782 | Alfred Electronics, 3176 Porter Drive, Palo Alto, California 94304 |
| 04009 | Arrow-Hart, & Hegeman Elec. Co., 113 Hawthorne St., Hartford, Conn. |
| 04713 | Motorola Semiconductor Products, Inc., P.O. Box 955, Phoenix, Arizona |
| 05783 | Stewart Engineering Co., 467 Bean Creek Rd., Santa Cruz, Calif. |
| 05820 | Wakefield Engineering Inc., 139-T Foundry St., Wakefield, Mass. |
| 06049 | Topaz, 3802 Houston, San Diego, California 92110 |
| 06555 | Beede Electrical Instrument Co., Inc., Penacock, N.H. |
| 06980 | Varian, 611 Hansen Way, Palo Alto, Calif. (BWO) |
| 02735 | Radio Corp. of America, Electronic Components & Devices, 415 S. 5th St. Harrison, N.J. |
| 07137 | Transistor Electronics Corp., Box 6191, Minneapolis, Minn. |
| 07263 | Fairchild Semiconductor, 545 Whisman Rd., Box 880, Mountain View, Calif. |
| 08806 | General Electric Corp., Min. Lamp Dept., Nela Park, Cleveland, Ohio |
| 09022 | Cornell-Dubilier, 50 Paris St., Newark, N.J. (Mica Caps) |
| 09023 | Cornell-Dubilier, 50 Paris St., Newark, N.J. (Electrolytic Caps) |
| 09297 | CP Electronics Inc., Columbus, Ind. |
| 11312 | Microwave Electronics Div. of Teledyne, 3165 Porter Drive, Palo Alto, Calif. |
| 12060 | Diodes, Inc., 9261 Independence Ave., Chatsworth, Calif. |
| 12122 | Astrodyne, Inc., 2nd Ave., NW. Ind. Park, Burlington, Mass. 01803 |
| 12360 | Albany Products, 351 Connecticut Ave., South Norwalk, Conn. |
| 12697 | Clarostat Mfg. Co., Washington St., Dover, N.H. |
| 13664 | Workman Elec. Prod. Inc., Packing House Rd., Sarasota, Florida 33578 |
| 13862 | Alasco Rubber & Plastic Corp., 839 Malcom Rd., Burlingame, Calif. |
| 14026 | Spatron, Inc., 715 S. Raymond Ave., Alhambra, California 91803 |
| 14433 | International Telephone & Telegraph, 3301 Electronic Way, W. Palm Beach, Florida |
| 14482 | Watkins-Johnson Co., 3333 Hillview, Palo Alto, California |
| 15582 | Bay City Screw & Bolt Co., 601 Industrial Way, San Carlos, Calif. |
| 15818 | Amelco, 1300 Terra Bella, Mt. View, Calif. 94042 |
| 16299 | Corning Glass Works, Electronic Products Div., 3906 Electronics Dr., Raleigh, N.C. |
| 16741 | Triad Dist. Div. (Litton Ind.) 305 N. Briant St., Huntington, Ind. |
| 17474 | Tranex, Inc., 1599 Stierlin Rd., Mountain View, California |
| 17545 | Atlantic Semiconductors, Inc., 905 Mattison Ave., Asburg Park, N.J. 07712 |
| 17920 | Warnecke Electron Tubes, 175 W. Oakton St., Des Plaines, Ill. |
| 18489 | Reliable Capacitors Co., 14716 Arminta St., Van Nuys, Calif. |
| 18915 | Birtcher Corp., The Industrial Div., 745 S. Monterey Pass Rd., Monterey Park, Calif. |
| 19701 | Electra Mfg. Co., 800 North 21, Independence, Kansas |
| 20286 | Daytron, Inc., 1269 Terra Bella, Mountain View, California |
| 20649 | Universal Metal Products, 5924 N. Western Ave., Chicago 45, Ill. |
| 21030 | Beckman Instrument, Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, California |
| 21743 | Conseat Corp., 4164 Greenbush Ave., Sherman Oaks, Calif. |
| 22229 | Union Carbide, KEMET Elect. Div., Mountain View, California |
| 23880 | Standford Applied Engineering, 340 Martan Ave., Santa Clara, Calif. |
| 24220 | Gowanda, 179 Broadway Rd., Gowanda, N.Y. |
| 24796 | Porelco, Inc., 26181 Avenida Aevoprierto, San Juan Capistrano, California |
| 27014 | National Semi-Conductor Corp., 2950 San Ysidro Way, Santa Clara, Calif. |
| 28480 | Hewlett-Packard, Paeco Div., 3215 Porter Drive, Palo Alto, California |
| 31918 | International Electronics Exchange, 6529 Cambridge St., Minneapolis, Minn. 55426 |
| 33173 | General Electric Corporation., Tube Dept., 316 E. Ninth St., Owenboro, Ky. |
| 35434 | Lectrohm, Inc., 5560 Northwest Hwy., Chicago, Ill. |
| 37942 | Mallory Capacitor Co., Div. P.R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis, Ind. |
| 42190 | The Muter Co., 1255 S. Michigan Ave., Chicago 5, Ill. |
| 42498 | National Radio Co., Melrose, Mass. |
| 44655 | Ohmite Mfg., Co., 3635 W. Howard St., Skokie, Ill. |
| 46384 | Penn Engineering, West State St., Doylestown, Penn. |
| 56289 | Sprague Electric Co., 91 Marshall St., N. Adams, Mass. |
| 59730 | C/O Thomas & Betts Co., 645 Phelps St., San Francisco, California |

| FMC | Full Name and Address of Vendor |
|---|---|
| 70309 | Allied Control Co., Inc., 2 East End Ave., New York, New York |
| 70563 | Amperite Co., Inc., 600 Palisade Ave., New Jersey |
| 70903 | Belden Mfg. Co., Box 5070-A, Chicago, Ill. 60644 |
| 71436 | Chicago Condenser Corporation, 3253 Armitage Ave., Chicago, Ill. 60647 |
| 71450 | CTS Corp., 1172 W. Beardsley, Elkhart, Ind. |
| 71590 | Centralab, Electronics Div., Globe Union, 934 Keefe Ave., Milwaukee, Wisconsin |
| 71785 | Cinch Mfg. Co., 1026 S. Homan Ave., Chicago 24, Ill. |
| 71895 | Delavan Mfg. Co., Electro-Sonics Div., West Des Moines, Iowa |
| 72982 | Erie Technological Products, Inc., 644 W. 12th St., Erie, Penn. |
| 72012 | M. Ducommun Mfg. Co., 580 Fifth Ave., New York , New York 90036 |
| 72136 | Electro Motive Mfg. Co., Inc., S. Park & John Streets, Williamantic, Conn. |
| 72765 | Drake Mfg. Co., 4626 N. Olcott Avenue, Harwood Heights, N.Y. 60656 |
| 72983 | Stancor Electronics (Essex Wire Corp.) 3501 W. Addison St., Chicago, Ill. |
| 73293 | Hughes Aircraft Co., Elec. Comp., Div., 500 Superior Ave., Newport Beach, Calif. |
| 73445 | Amperex Electronic Corporation, Box 418, 230 Duffy Ave., Hicksville, N.Y. |
| 73899 | JFD Elect. Co., Comp. Div., 15th Ave., at 62nd St., Brooklyn, N.Y. |
| 74542 | Hoyt Electrical Inst. Works, Inc., 42 Carleston St., Cambridge, Mass. |
| 74868 | Amphenol Corp., Connector Div., 1830 S. 54th Ave., Chicago, Ill. |
| 74970 | The E.F. Johnson Co., 1923 10th Ave., S.W. Waseca, Minn. |
| 75376 | Kurz Kasch, 1417 S. Broadway, Dayton, Ohio |
| 75382 | Kulka Electric Corp., 520 S. Fulton Ave., Mt. Vernon, N.Y. |
| 75042 | IRC, Inc., 401 N. Broad St., Philadelphia, Penn. |
| 75497 | Lamson & Sessions, 5002 Tiedeman Rd., Cleveland, Ohio |
| 75915 | Littlefuse, Inc., 800 E. Northwest Hwy., Des Plaines, Ill. |
| 76433 | General Instrument Corp., 65 Gouverneur, Newark, N.J. |
| 76487 | James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass. |
| 76854 | Oak Mfg. Co., Crystal Lake, Ill. |
| 77342 | Potter & Brumfield, Div., American Machine & Foundry Co., 1200 E. Broadway, Princeton, Ind. |
| 77557 | Reliable Spring & Wire Forms Co., 3167 Fulton Rd., Cleveland, Ohio |
| 78553 | Tinnerman Co., Dept. 16-T, P.O. Box 6688, Cleveland, Ohio |
| 78947 | Ucinite Corporation, 459 Watertown St., Newtonville, Mass. 02160 |
| 79493 | J.W. Miller Co., 5915 S. Main St., Los Angeles, Calif. 90003 |
| 80294 | Bourns, Inc., 1200 Columbia Ave., Riverside, California 92507 |
| 81073 | Grayhill, Inc., 569 Hillgrove Ave., La Grange, Ill. |
| 81312 | Winchester Electronics, Inc., Div. Litton Industries, 19 Willard Rd., Norwalk, Conn. |
| 82389 | Switchcraft, Inc., 5555 N. Elston Ave., Chicago 30, Ill. |
| 83186 | Victory Engineering, 128 Springfield Ave., Springfield, New Jersey |
| 83701 | Electronic Devices, Inc., 21 Grey Oaks Ave., Yonkers, N.Y. |
| 88245 | USECO, Div. of Litton Industries, 13536 Saticoy St., Van Nuys, Calif. |
| 89536 | John Fluke Mfg. Co., Inc., P.O. Box 7428, Seattle, Wash. |
| 91278 | Stoesser Tool & Die, 3366 Fayette Dr., Mountain View, California |
| 91418 | Radio Materials Co., 4242 W. Bryn Mawr Ave., Chicago 46, Ill. |
| 91637 | Dale Electronics, Inc., (Subs. Lionel Corp.), Box 609, 1342 - 28th St., Columbus, Nebr. |
| 91737 | Gremar Mfg. Co., Wakefield, Mass. |
| 91755 | Harrison & Bonini, 1122 Harrison St., San Francisco, California |
| 91827 | K & F Tool Die & Mfg. , Inc., 1203 Dell Ave., Campbell, California |
| 93332 | Sylvania Electric Products, Inc., Semiconductor Div., 100 Sylvan Rd., Woburn, Mass. |
| 93389 | Proto Stamping, Washington & Santa Fe, Los Angeles 54, Calif. |
| 94144 | Raytheon, 465 Centre St., Quincy, Mass. 02164 |
| 94375 | Automatic Metal Products Corp., 323 Berry St., Brooklyn 11, N.Y. |
| 95263 | Leecraft Mfg. Co., Inc., 44-35 - 21st St., Dept. E., Long Island City, N.Y. |
| 95354 | Methode Electronics, Inc., 7447 W. Wilson Ave., Chicago, Ill. |
| 95987 | Weckesser Co., Inc., 4444 W. Irving Park, Chicago, Ill. |
| 96214 | Texas Instruments, Inc., Semiconductor-Components Div., Box 5012, Dallas, Texas |
| 96791 | Borg Electronics, Div., Amphenol-Borg Electronics Corp., 120 S. Main St., Janesville, Wisc. |
| 97464 | Industrial Retaining Ring Co., 57 Cordier St., Irvington, N.J. |
| 99120 | Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill. |
| 99313 | Varian, 611 Hansen Way, Palo Alto, California (BWO) |
| 99942 | Hoffman Electronics Corp., Semiconductor Div., Box 471, El Monte, California |

## ADDITIONAL NUMBERS

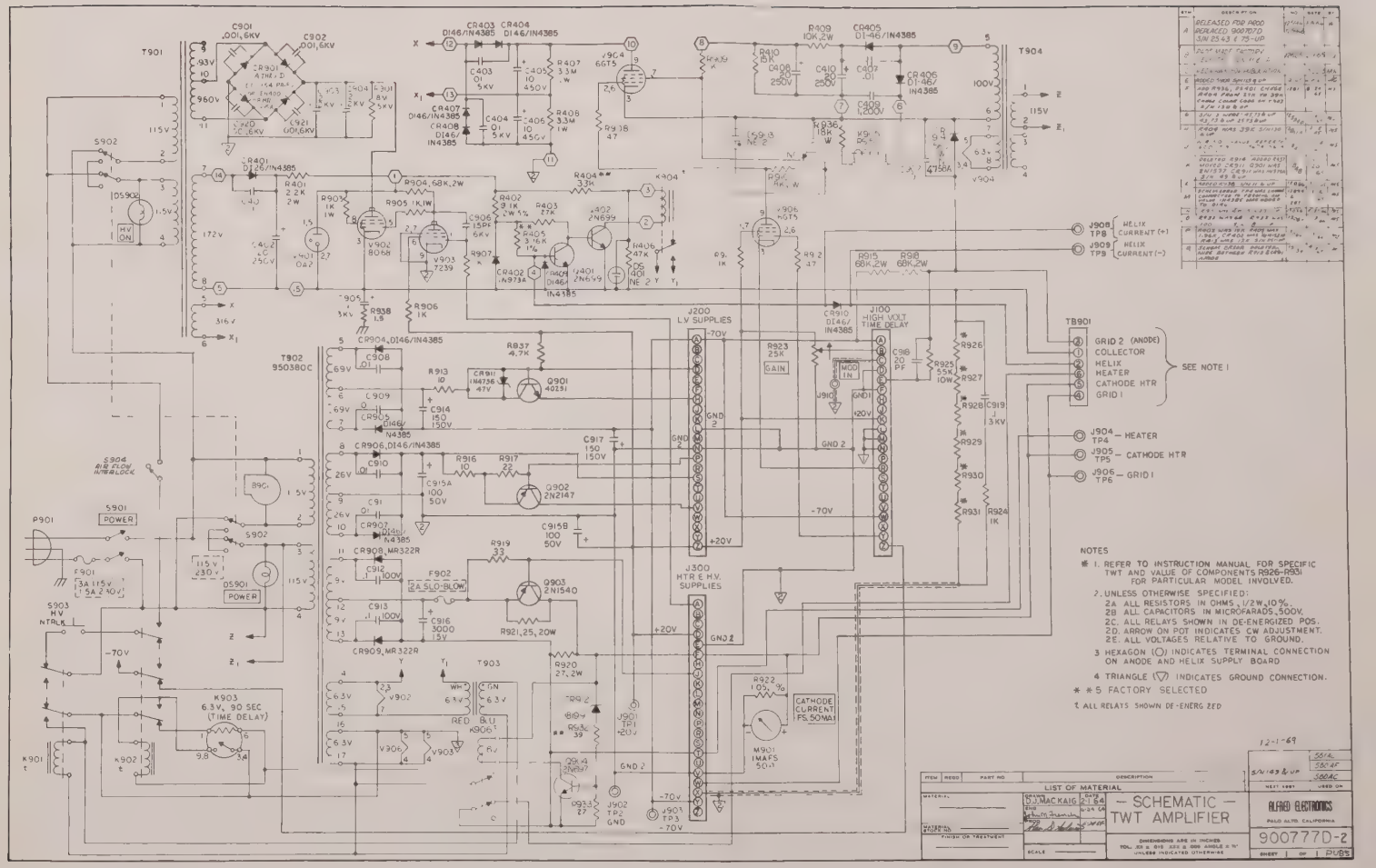
| FMC | Full Name and Address of Vendor |
|---|---|
| 00929 | Microlab/FXR, 10 Micralab Rd., Livingston, N.J. |
| 02114 | Ferroxcube Corp. of America, Mt. Marion Rd., Saugerties, N.Y. 12477 |
| 02116 | Wheelock Signals Inc., 273 Branchport Ave., Long Branch, N.J. 07440 |
| 03888 | Pyrofilm, 3 Saddleroad, Cedar Knolls, N.J. 07927 |
| 04773 | Automatic Electric Co., Wolf Rd. Northlake, Ill. 60164 |
| 11870 | Melabs, Inc., 3300 Hillview, Palo Alto, Calif. 94304 |
| 12598 | RLC Electronics, Inc., 25 Martin Pl., Port Chester, N.Y. 10573 |
| 13175 | Electro-Mechanical Corp., 701 S. Elmer Ave., Sayre, Pa. 18840 |
| 18741 | High Vacuum Electronics, Inc., 538 Mission St., So. Pasadena, Calif. 91030 |
| 23095 | Aztec Electronics, Inc., 163 Liberty Ave., Anaheim, Calif. 92801 |
| 24931 | Spec. Connector Co., 3560 Madison Ave., Indianapolis, Ind. 46227 |
| 26851 | Compac Eng. Co., 810 East St., Hollister, Calif. 95023 |
| 70318 | Allmetal Screw Products Co. Inc., 821 Stewart Ave., Garden City, N.Y. |
| 71707 | Cato Coil Co. Inc., Box B, Edgewood Station, Providence, R.I. |
| 73559 | Carling Electric Inc., 505 New Park Ave., West Hartford, Conn. 06110 |
| 80080 | Litton, San Carlos, Calif. (Vac. Tube Div.) |
| 82227 | Haydon, A.W., Co., 232 N. Elm St., Waterbury, Conn. 06720 |
| 89110 | AMP, Inc., 155 Park St., Elizabethtown, Pa. |
| 91836 | Kings Elec., 40 Marblehead Rd., Tuckahoe, N.Y. 11223 |
| 94696 | Magnecraft Electric Co., 5579 N. Lynch Rd., Chicago, Ill. 60630 |
| 95348 | Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J. 07003 |
| 95712 | Dage, Franklin, Ind. |
| 98003 | Nellson Hdwr. Corp., 770 Weathersfield Ave., Hartford, Conn. |
| 99779 | Barnes Dev. Co., 213 W. Baltimore Pike, Lansdowne, Pa. 19050 |

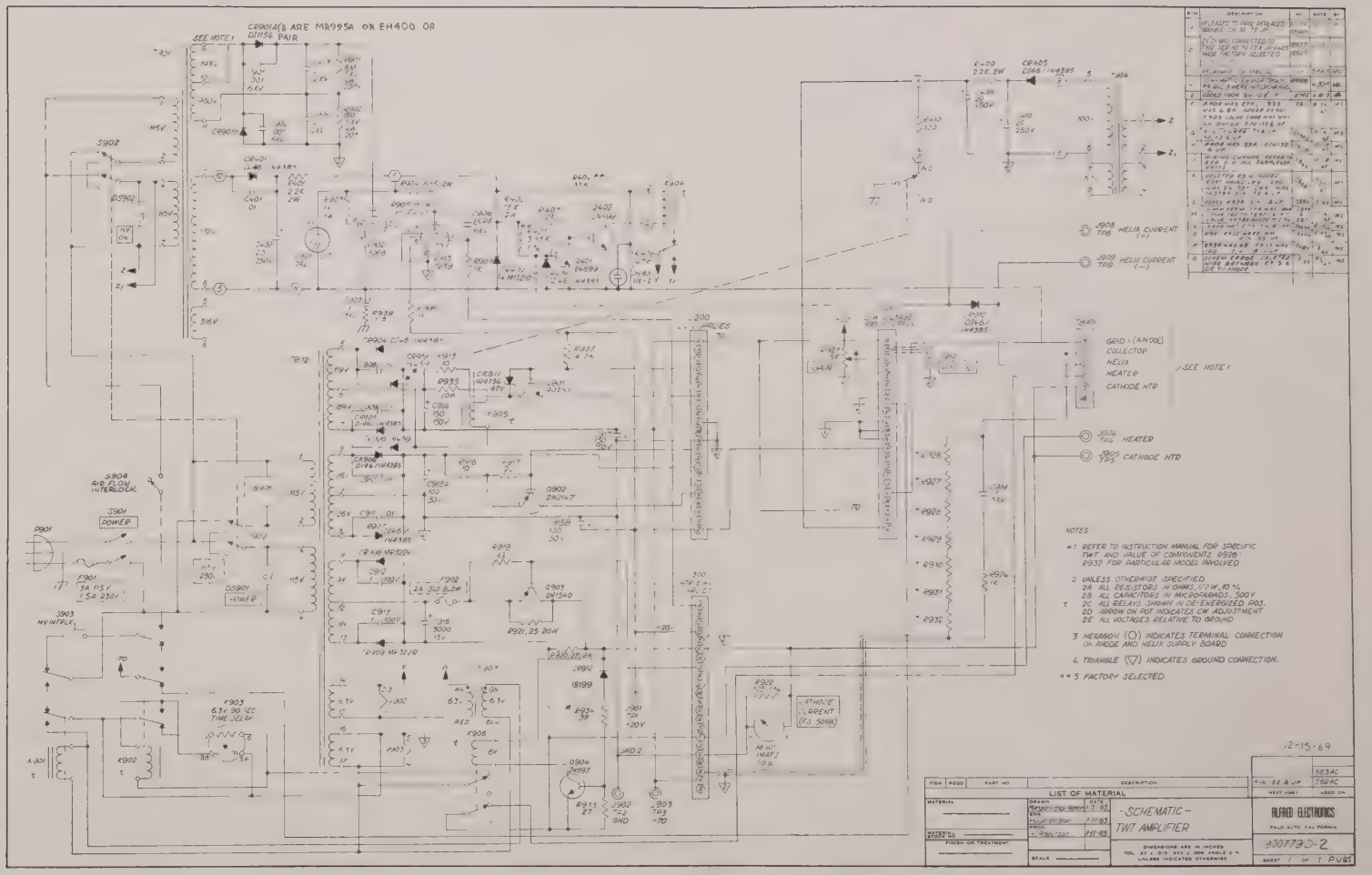
# SECTION 6

# SCHEMATICS

Schematics are included in the following order:

| | |
|---|---|
| Main Chassis and High Voltage Component Board Assy. for Models 560A and 561A only: | D900777 |
| Main Chassis and High Voltage Component Board Assy. for Models 562A and 563A only: | D900779 |
| High Voltage Anode Supply PC Board Assy. 950831 for Models 560A and 561A only: | C900778 |
| Low Voltage Anode Supply PC Board Assy. 901463 for Models 562A and 563A only: | C900864 |
| Low Voltage ( + 20 v & - 70 v) PC Board Assy. 901274 for all 560 Series Amplifiers: | C900682 |
| Heater and High Voltage Supplies PC Board Assy. 950390 for all 560 Series Amplifiers: | C900683 |


T901
T902 950380C
T903
T904
J100 HIGH VOLT TIME DELAY
J200 LV SUPPLIES
J300 HTR & H.V. SUPPLIES
TB901
GRID 2 (ANODE)
COLLECTOR
HELIX
HEATER
CATHODE HTR
GRID 1
SEE NOTE 1
J904 — HEATER TP4
J905 — CATHODE HTR TP5
J906 — GRID 1 TP6
J908 HELIX CURRENT (+) TP8
J909 HELIX CURRENT (−) TP8
S901 POWER
S902
S903 HV INTRLK
S904 AIR FLOW INTERLOCK
K903 6.3V, 90 SEC (TIME DELAY)
M901 1MAFS 50-1
CATHODE CURRENT FS 50MA
P901
F901 3A 115V 1.5A 230V
F902 2A SLO-BLOW
DS901 POWER
DS902 HV ON
+20V
-70V
GND 2
GAIN
NOTES
* 1. REFER TO INSTRUCTION MANUAL FOR SPECIFIC TWT AND VALUE OF COMPONENTS R926-R931 FOR PARTICULAR MODEL INVOLVED.
2. UNLESS OTHERWISE SPECIFIED:
2A ALL RESISTORS IN OHMS, 1/2W, 10%.
2B ALL CAPACITORS IN MICROFARADS, 500V.
2C ALL RELAYS SHOWN IN DE-ENERGIZED POS.
2D. ARROW ON POT INDICATES CW ADJUSTMENT.
2E. ALL VOLTAGES RELATIVE TO GROUND.
3 HEXAGON (⬡) INDICATES TERMINAL CONNECTION ON ANODE AND HELIX SUPPLY BOARD
4 TRIANGLE (▽) INDICATES GROUND CONNECTION.
* *5 FACTORY SELECTED
† ALL RELAYS SHOWN DE-ENERGIZED
12-1-69
S/N 143 & UP
LIST OF MATERIAL
SCHEMATIC — TWT AMPLIFIER
D.J. MACKAIG
ALFRED ELECTRONICS
PALO ALTO, CALIFORNIA
900777D-2
DIMENSIONS ARE IN INCHES
SHEET 1 OF 1 PGS


CR9014 & ARE MR995A OR EH400 OR D1156 PAIR
SEE NOTE 1
S902
S904 AIR FLOW INTERLOCK
S901 POWER
P901
F901 3A 115V 1.5A 230V
S903 HV INTRLK
F903 6.3V 90 SEC TIME DELAY
F902 2A SLO BLOW
CR901 D146/1N4385
CR902 D146/1N4385
CR903 MR322R
CR904 MR322R
CR905 D146/1N4385
CR906 MR322R
CR907 D146/1N4385
CR908 D146/1N4385
CR909 D146/1N4385
CR910 D146/1N4385
CR911 1N4736 6.8V
Q901 2N1711
Q902 2N2147
Q903 2N1540
Q904 2N697
Q905 2N599
Q906 2N1893
Q907 2N1893
Q908 2N1893
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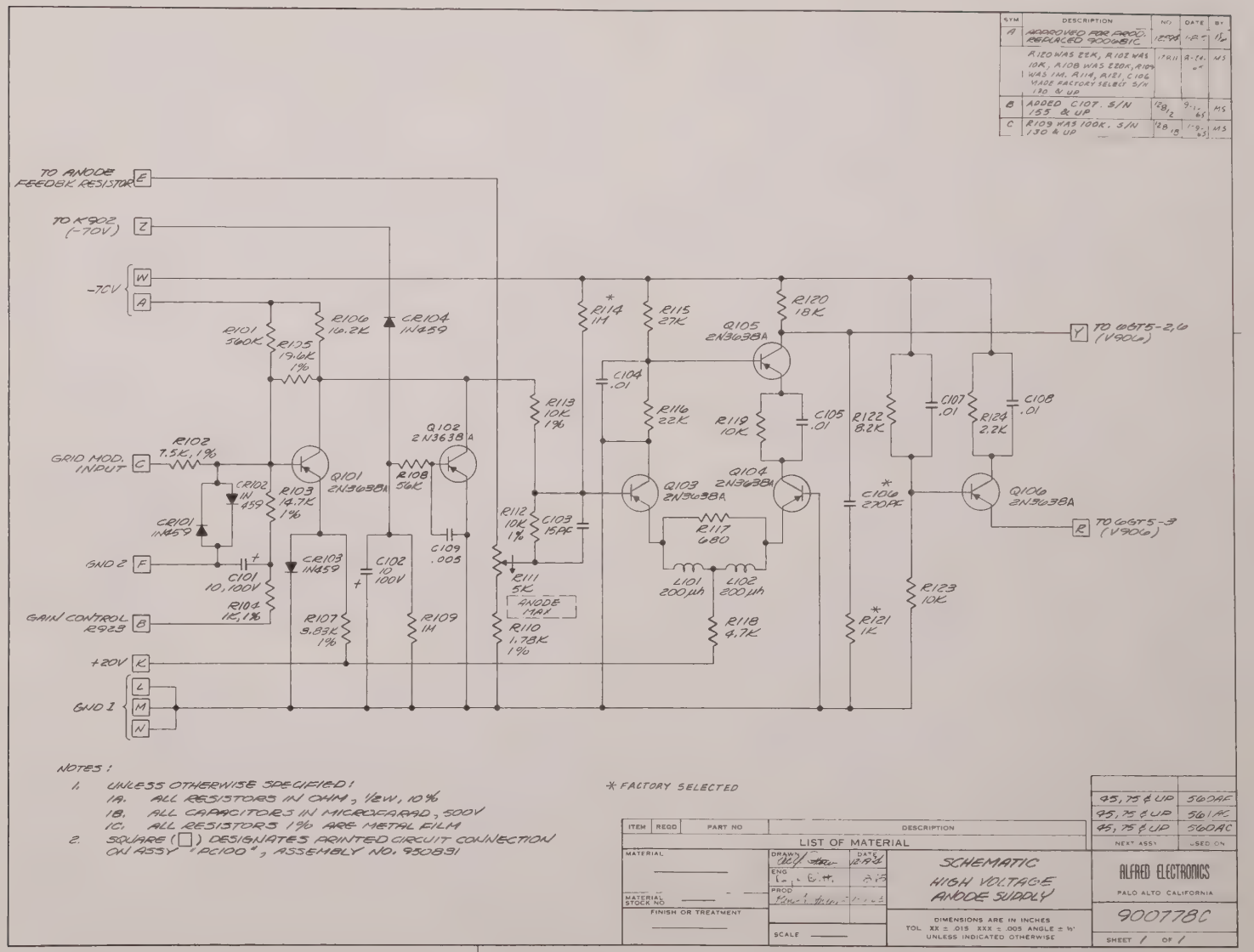
Q994 2N1893
Q995 2N1893
Q996 2N1893
Q997 2N1893
Q998 2N1893
Q999 2N1893
Q1000 2N1893
J905 HELIX CURRENT (+)
J903 HELIX CURRENT (−)
J901 GRID 1 (ANODE)
COLLECTOR
HELIX
HEATER
CATHODE HTR
SEE NOTE 1
J904 HEATED
J905 CATHODE HTR
NOTES
1 REFER TO INSTRUCTION MANUAL FOR SPECIFIC TWT AND VALUE OF COMPONENTS R926-R932 FOR PARTICULAR MODEL INVOLVED
2 UNLESS OTHERWISE SPECIFIED
2A ALL RESISTORS IN OHMS, 1/2W, 10 %
2B ALL CAPACITORS IN MICROFARADS, 500V
2C ALL RELAYS SHOWN IN DE-ENERGIZED POS.
2D ARROW ON POT INDICATES CW ADJUSTMENT
2E ALL VOLTAGES RELATIVE TO GROUND
3 HEXAGON (⬡) INDICATES TERMINAL CONNECTION ON ANODE AND HELIX SUPPLY BOARD
4 TRIANGLE (▽) INDICATES GROUND CONNECTION.
* 5 FACTORY SELECTED
12-15-69
LIST OF MATERIAL
-SCHEMATIC-
TWT AMPLIFIER
ALFRED ELECTRONICS
PALO ALTO, CALIFORNIA
9007790-2
SHEET 1 OF 1 PGS




NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   - 1A. ALL RESISTORS IN OHM, 1/2W, 10%
   - 1B. ALL CAPACITORS IN MICROFARAD, 500V
   - 1C. ALL RESISTORS 1% ARE METAL FILM
2. SQUARE (□) DESIGNATES PRINTED CIRCUIT CONNECTION ON ASSY "PC100", ASSEMBLY NO. 950831

* FACTORY SELECTED

| SYM | DESCRIPTION | NO | DATE | BY |
|---|---|---|---|---|
| A | MODIFIED FOR PROD. REPLACED 900ABIC | 12598 | 1-2-65 | MS |
| | R120 WAS 22K, R102 WAS 10K, R108 WAS 220K, R109 WAS 1M. R114, R121, C106 MADE FACTORY SELECT S/N 120 & UP | 12611 | 2-16-65 | MS |
| B | ADDED C107. S/N 155 & UP | 12812 | 9-16-65 | MS |
| C | R109 WAS 100K. S/N 130 & UP | 12813 | 10-8-65 | MS |

| ITEM | REQD | PART NO | DESCRIPTION |
|---|---|---|---|
| | | | LIST OF MATERIAL |

| NEXT ASSY | USED ON |
|---|---|
| | |
| 95, 75 & UP | 560AF |
| 95, 75 & UP | 561AC |
| 95, 75 & UP | 560AC |

MATERIAL

MATERIAL STOCK NO

FINISH OR TREATMENT

DRAWN — DATE 12-9-64

ENG. — DATE 2-15

PROD — DATE

SCALE

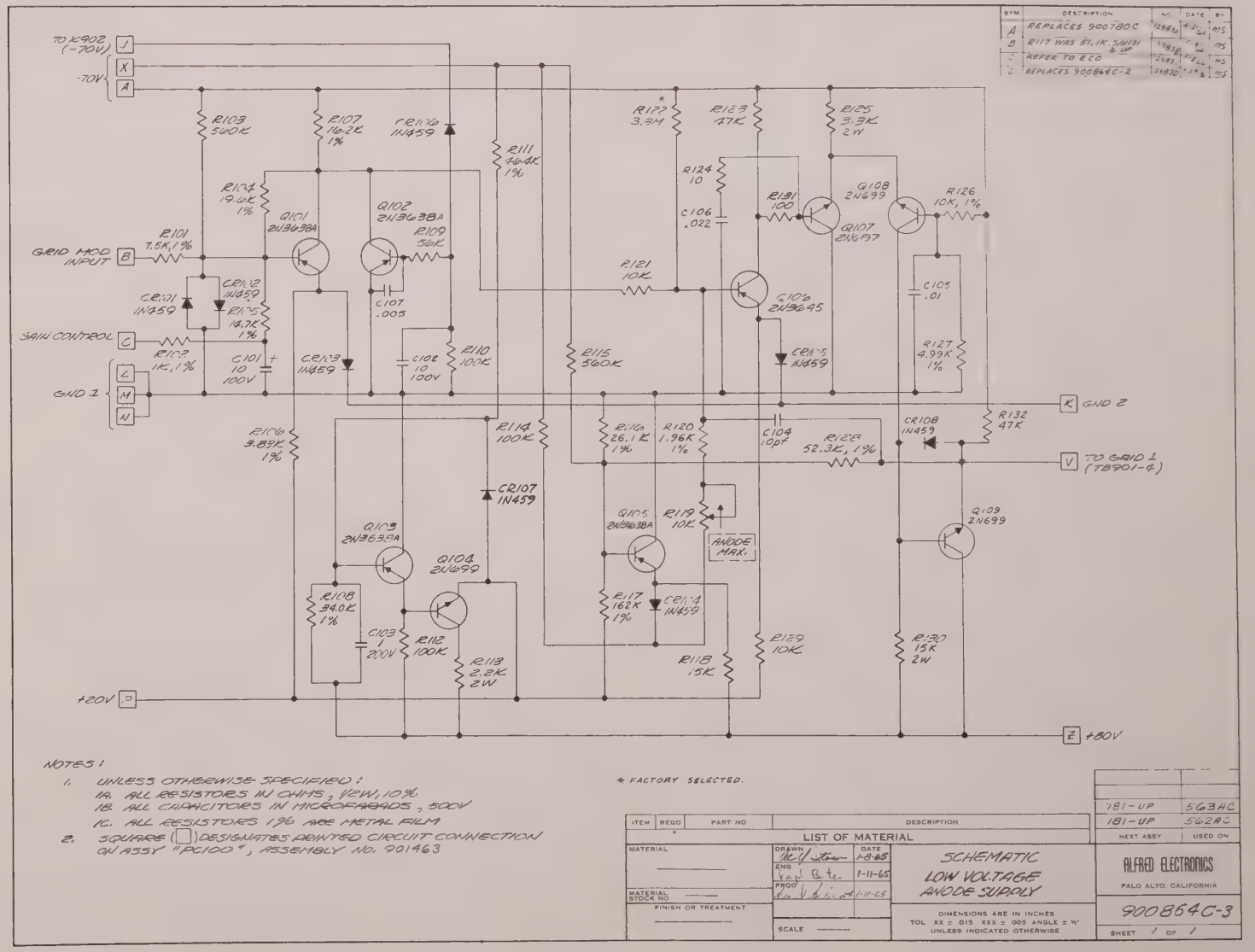
DIMENSIONS ARE IN INCHES
TOL .XX ± .015 .XXX ± .005 ANGLE ± 1°
UNLESS INDICATED OTHERWISE

# SCHEMATIC HIGH VOLTAGE ANODE SUPPLY

ALFRED ELECTRONICS
PALO ALTO CALIFORNIA

900778C

SHEET 1 OF 1




| SYM | DESCRIPTION | NO. | DATE | BY |
|---|---|---|---|---|
| A | REPLACES 900780C | 12981 | 4-21-65 | MS |
| B | R117 WAS 51.1K 3/4/131 & UP | 12983 | 9-24-65 | MS |
| - | REFER TO ECO | 12981 | 7-8-65 | MS |
| C | REPLACES 900864C-2 | 12830 | 1-24-65 | MS |

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   - 1A. ALL RESISTORS IN OHMS, 1/2W, 10%.
   - 1B. ALL CAPACITORS IN MICROFARADS, 500V
   - 1C. ALL RESISTORS 1% ARE METAL FILM
2. SQUARE (□) DESIGNATES PRINTED CIRCUIT CONNECTION ON ASSY "PC100", ASSEMBLY NO. 901463

* FACTORY SELECTED.

| ITEM | REQD | PART NO | DESCRIPTION |
|---|---|---|---|
| | | | LIST OF MATERIAL |

MATERIAL

MATERIAL STOCK NO

FINISH OR TREATMENT

| | | DATE |
|---|---|---|
| DRAWN | [illegible] | 1-9-65 |
| ENG | [illegible] | 1-11-65 |
| PROD | [illegible] | 1-11-65 |

SCALE

DIMENSIONS ARE IN INCHES
TOL .XX = .015 .XXX = .005 ANGLE = ½°
UNLESS INDICATED OTHERWISE

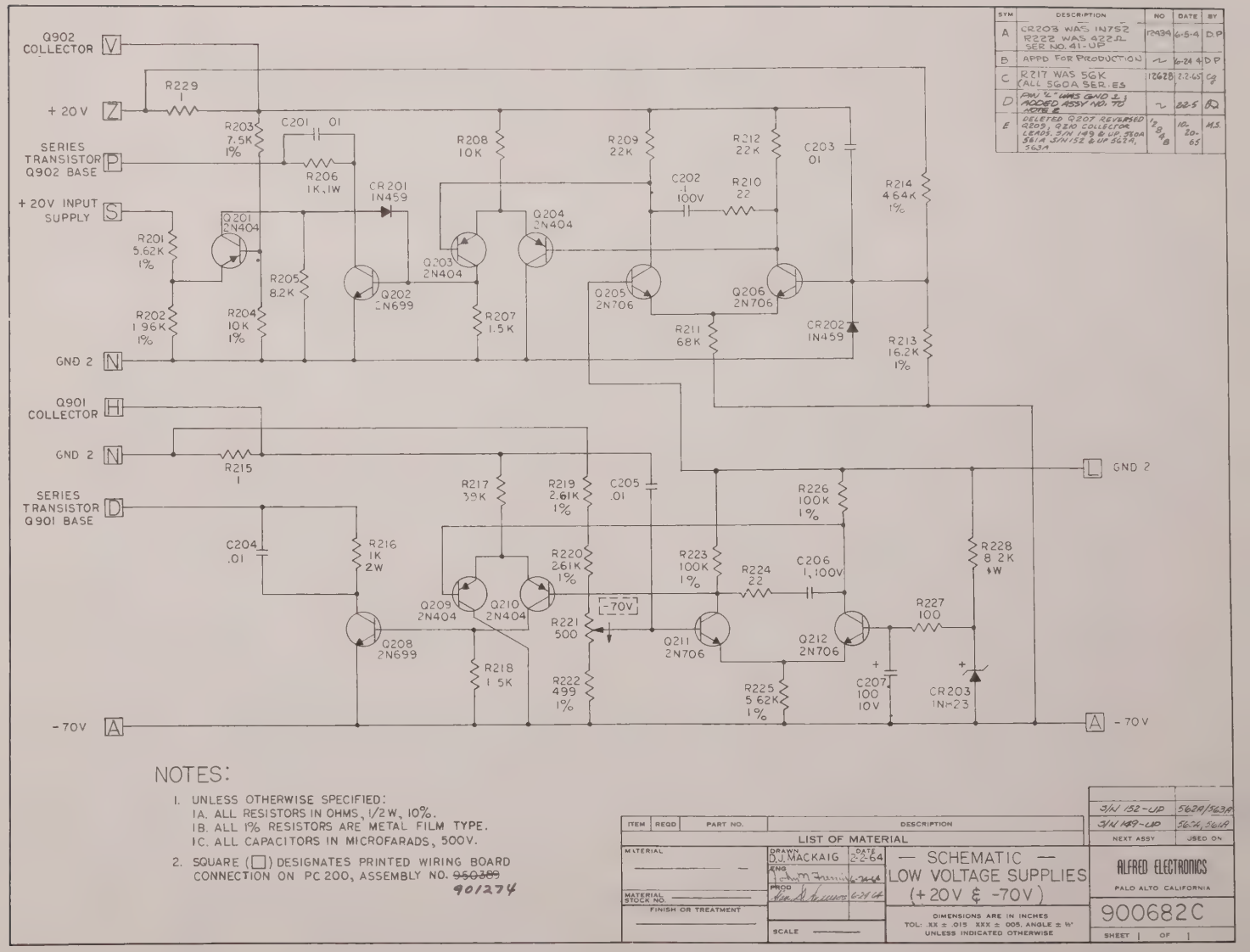
# SCHEMATIC LOW VOLTAGE ANODE SUPPLY

| | |
|---|---|
| 181-UP | 563AC |
| 181-UP | 562AC |
| NEXT ASSY | USED ON |

ALFRED ELECTRONICS
PALO ALTO, CALIFORNIA

900864C-3

SHEET 1 OF 1




| SYM | DESCRIPTION | NO | DATE | BY |
|---|---|---|---|---|
| A | CR203 WAS 1N752 R222 WAS 422Ω SER NO. 41-UP | 12439 | 6-5-64 | DP |
| B | APPD FOR PRODUCTION | ~ | 6-24-64 | DP |
| C | R217 WAS 5GK (ALL 5GOA SER. ES | 12628 | 2-2-65 | CG |
| D | PIN "C" WIRES GND 2 ADDED ASSY NO. TO NOTE E | ~ | 8-25-65 | RD |
| E | DELETED Q207 REVERSED Q205; Q210 COLLECTOR LEADS; S/N 149 & UP, 350A 381A S/N 132 & UP 562A, 563A | 12838 | 10-20-65 | MS |

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   1A. ALL RESISTORS IN OHMS, 1/2W, 10%.
   1B. ALL 1% RESISTORS ARE METAL FILM TYPE.
   1C. ALL CAPACITORS IN MICROFARADS, 500V.
2. SQUARE (□) DESIGNATES PRINTED WIRING BOARD CONNECTION ON PC 200, ASSEMBLY NO. ~~950389~~ 901274

| ITEM | REQD | PART NO. | DESCRIPTION |
|---|---|---|---|

LIST OF MATERIAL

MATERIAL —

MATERIAL STOCK NO.

FINISH OR TREATMENT

DRAWN D.J. MACKAIG 2-2-64

ENG

PROD

SCALE

— SCHEMATIC —
LOW VOLTAGE SUPPLIES
(+20V & -70V)

DIMENSIONS ARE IN INCHES
TOL: XX ± .015 XXX ± .005, ANGLE ± ½°
UNLESS INDICATED OTHERWISE

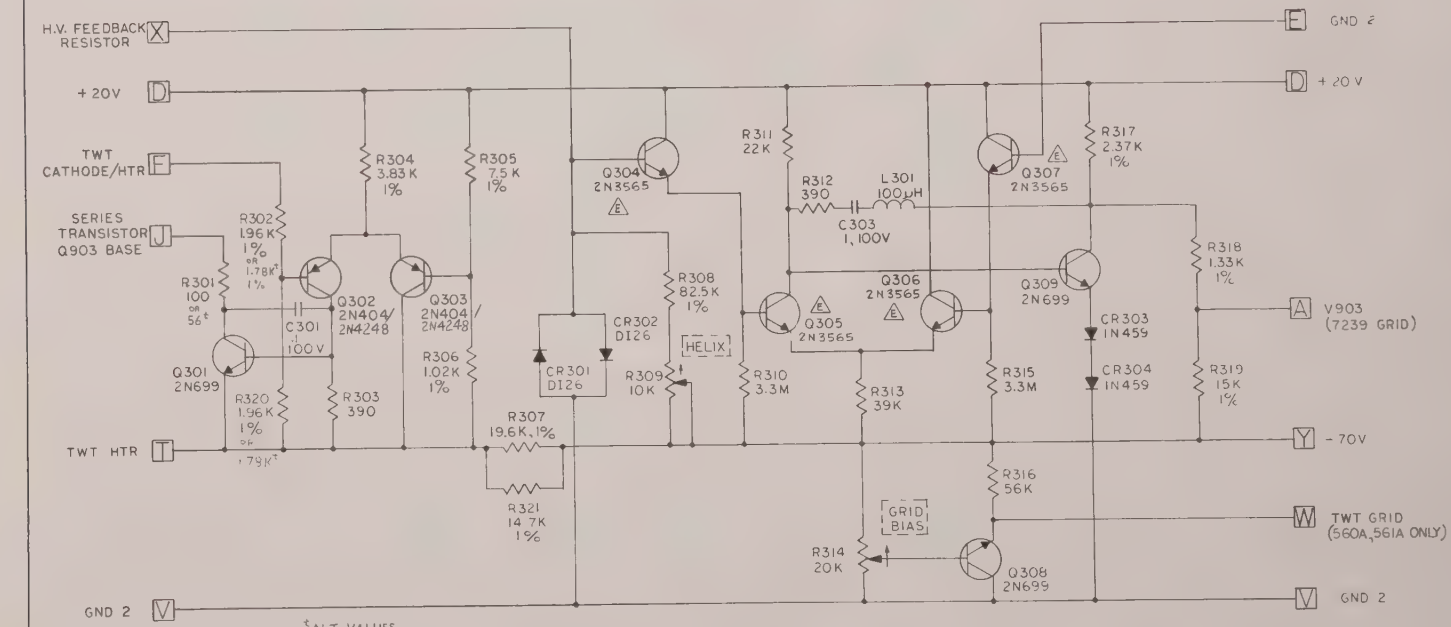
| S/N 152-UP | 562A/563A |
|---|---|
| S/N 149-UP | 562A, 563A |
| NEXT ASSY | USED ON |

ALFRED ELECTRONICS
PALO ALTO CALIFORNIA

900682C

SHEET 1 OF 1

| SYM | DESCRIPTION | NO | DATE | BY |
|---|---|---|---|---|
| A | R306 WAS 1.05K EFFECTIVE SN 21-UP | 129 | 5-16-4 | I F |
| F | 1ST PRODUCTION | ~ | 6-2-4 | D P |
| C | DELETED C302 SER NO. 11-UP | 12516 | 9-15-4 | G P |
| D | ADDED "560A/561A ONLY" TO PART N | ~ | 2-2-5 | Q |
| E | REVISED | 13713 | 9-8-68 | PS |




*ALT VALUES
560/61: S/N 491 & UP
562/63: S/N 1543 & UP

## NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   1A. ALL RESISTORS IN OHMS, 1/2 W, 10%.
   1B. ALL 1% RESISTORS ARE METAL FILM TYPE.
   1C. ALL CAPACITORS IN MICROFARADS, 500V.
2. SQUARE (□) DESIGNATES PRINTED WIRING BOARD CONNECTION ON PC300, ASSEMBLY NO. 950390.

12/15/69

| ITEM | REQD | PART NO. | DESCRIPTION |
|---|---|---|---|
| | | | LIST OF MATERIAL |

MATERIAL
MATERIAL STOCK NO
FINISH OR TREATMENT
DRAWN D.J. MACKAIG DATE
ENG
PROD
SCALE

— SCHEMATIC —
HEATER & HIGH VOLTAGE SUPPLIES

DIMENSIONS ARE IN INCHES
TOL .XX ± .015, .XXX ± .005 ANGLE ± ½°
UNLESS INDICATED OTHERWISE

NEXT ASSY: 560A 562 E5
USED ON

ALFRED ELECTRONICS
PALO ALTO CALIFORNIA

SIZE C | 900683 | REV E

SHEET 1 OF 1 PUBS

# Tube Warranty and Replacement Procedure

## TUBE REPLACEMENT

All TWT and BWO tubes furnished in ALFRED instruments are available from ALFRED ELECTRONICS for either warranty or out-of-warranty replacements. Current prices are given on the Replacement Tube Price List.

## TUBE WARRANTY

The following warranties are applicable to tubes used in catalog instruments only. For the warranty applicable to tubes used or for use in special or modified instruments, please check with the factory. All tube warranties are from date of shipment by ALFRED.

### WARRANTY FOR TWT AND VTM

Tubes are warranted unconditionally against defects in workmanship, materials, and construction within the period shown in Column A and the number of heater hours shown in Column B. To supplement the unconditional warranty, the tubes are warranted on a pro-rata basis for the rated number of heater hours shown in Column C or for one year, both computed from the date of original shipment by ALFRED, whichever expires first. The pro-rated adjustment will be based on the current list price of the tube and the unused percentage of heater hours (Column C) or one-year time period, whichever results in lesser credit.

| Warranty Condition* | Tube Type | Applicable Tube Group or Alfred Tube Part No. Series | A Mo. | B Hours | C Hours |
|---|---|---|---|---|---|
| WC2 | VTM | 112-001 and 112-003 | 2 | 100 | 1000 |
| WC3 | TWT | 10 and 20 mw output except WC4 tubes | 12 | 500 | 2000 |
| WC4 | TWT | 112-040 and 112-047 | 12 | 2000 | - |
| WC5 | TWT | 1 watt output except WC6 and WC7 tubes | 12 | 1500 | - |
| WC6 | TWT | 112-046, 112-065, & 112-072 | 12 | 1000 | - |
| WC7 | TWT | 112-057, 112-080, & 112-081 | 12 | 250 | 1000 |
| WC8 | TWT | 2, 10, & 20 watt output except WC9 tubes | 12 | - | - |
| WC9 | TWT | 112-055 | 2 | 50 | 500 |

* WC# denotes the corresponding warranty period(s) shown in the right-hand column(s) and is used for cross-reference to this warranty statement from other documents.

### WARRANTY FOR ALL BWO TUBES

Tubes are warranted unconditionally against defects in workmanship, materials, and construction within the period shown below, without regard to the number of heater hours used.

| Warranty Condition* | Tube Type | Warranty |
|---|---|---|
| WC10 | BWO | Warranted unconditionally for one (1) year. |

WARRANTY CONDITIONS APPLY ONLY TO TUBES LISTED ABOVE WHICH ARE USED IN ALFRED CATALOG INSTRUMENTS.

This warranty applies only to tubes sold after July 1, 1969.

## TUBE SERVICE REPORT

TO OBTAIN WARRANTY CREDIT THE TUBE SERVICE REPORT MUST BE COMPLETED AND RETURNED WITH THE TUBE.

## RETURN PROCEDURE

In case a tube or instrument fails, please contact the factory or your local sales representative for advice or authorization to return either the tube or the instrument to the factory. NO TUBE OR INSTRUMENT WILL BE ACCEPTED FOR REPAIR OR CREDIT ADJUSTMENT WITHOUT WRITTEN AUTHORIZATION AND ACCOMPANYING SERVICE REPORT.

When the authorization is received, pack the tube in a rigid container (use original carton if available) at least 4" larger than the tube in each dimension. Wrap the tube with 1/4" of soft padding material and heavy kraft paper before placing in container. Pack at least 2" of resilient dunnage such as rubberized hair, foam, or similar shock absorbing material completely around the tube. Mark the container "FRAGILE" and ship PREPAID via air freight, air express or rail express. Do not ship via parcel post or air parcel post since experience has shown that fragile items are more apt to be damaged when shipped via these methods.

Use similar wrapping, packing and shipping provisions for an instrument. At least 6" of rubberized hair (or equivalent shock absorbing material) is required for an instrument.

## IN-WARRANTY FAILURE - BWO AND VTM TUBES

BWO and VTM tubes which fail in warranty will be replaced with a new tube. In case a tube fails, please issue a purchase order for a new tube at the tube list price and return the defective tube. Warranty credit will be issued and deducted from the price, subject to tube manufacturer's verification that failure was caused by tube malfunction. To qualify for maximum credit, it is essential that the defective tube be properly packed and returned within 30 days after failure.

## REPAIRABLE OR IN-WARRANTY FAILURE - TW TUBES

If the returned tube is found to be repairable, the user will be asked to issue a purchase order for repair charges determined by the original tube manufacturer. In general, the repair will be at no cost if the tube is in warranty and there is no evidence of misuse or abnormal conditions of operation.

## WARRANTY CREDIT

Any applicable credit allowed under the terms of this warranty applies only toward the purchase of a replacement tube from ALFRED ELECTRONICS. Cash settlements will not be made. In terms of this warranty, a replacement tube must be the same type as that on which credit is allowed. Credit for one tube only may be applied toward the purchase of a single replacement tube. Warranty credit remains in effect for a maximum of six (6) months from date ALFRED ELECTRONICS notifies the customer. All credits will be based on the purchase price of the tube which prevails at the time the order for a replacement tube is received by ALFRED ELECTRONICS.

## BWO RF CABLES

RF OUTPUT CABLE MUST ACCOMPANY BWO TUBES returned for warranty credit, repair or replacement. If rf output cable is NOT returned, the cable price is added to the normal BWO repair or replacement charge. For prices see Replacement Tube Price List.

## SPECIAL CONDITIONS

If a returned tube or instrument proves not to be defective after test and evaluation at ALFRED ELECTRONICS, the tube or instrument will be returned at the customer's expense.

The final determination as to whether the tube failed in normal operation thereby bringing it under the applicable warranty or whether the tube was misused thereby excluding it from application of the warranty provisions, lies solely with the tube manufacturer.

Data, warranty credit, and prices subject to change without notice.

7/6/71

# Service Report

Instrument Model _____ Serial No. _____ Date Received _____

TW/BWO Tube Type _____ Serial No. _____ Date Received _____

Date First Tested _____ Date Placed in Service _____ Date of Failure _____

Total Number of Hours of TWT/BWO Heater Operation _____

_____

1. Was operation normal just prior to failure? Yes _____ No _____
2. If not, what was done to adjust it? _____

   _____
3. Has proper cooling been maintained during tube operation? _____

   _____
4. Did helix overcurrent tripout occur? _____
5. Was environment normal? (specify) _____

   _____
6. Symptoms (describe failure) _____

   _____

   _____
7. Operating conditions at time of failure (indicate any unusual conditions) _____

   _____

   _____
8. Name of person to contact regarding evaluation of failure _____

   Telephone No. _____ Signature _____

   Title _____

   Date _____

**SINGER**
**INSTRUMENTATION**

The Singer Company, Palo Alto Operation, 3176 Porter Drive, Palo Alto, California 94304
Telephone: (415) 493-3231 TWX: 910-373-1765

# Tube Warranty and Replacement Procedure

## TUBE REPLACEMENT

All TWT and BWO tubes furnished in ALFRED instruments are available from ALFRED ELECTRONICS for either warranty or out-of-warranty replacements. Current prices are given on the Replacement Tube Price List.

## TUBE WARRANTY

The following warranties are applicable to tubes used in catalog instruments only. For the warranty applicable to tubes used or for use in special or modified instruments, please check with the factory. All tube warranties are from date of shipment by ALFRED.

### WARRANTY FOR TWT AND VTM

Tubes are warranted unconditionally against defects in workmanship, materials, and construction within the period shown in Column A and the number of heater hours shown in Column B. To supplement the unconditional warranty, the tubes are warranted on a pro-rata basis for the rated number of heater hours shown in Column C or for one year, both computed from the date of original shipment by ALFRED, whichever expires first. The pro-rated adjustment will be based on the current list price of the tube and the unused percentage of heater hours (Column C) or one-year time period, whichever results in lesser credit.

| Warranty Condition* | Tube Type | Applicable Tube Group or Alfred Tube Part No. Series | A Mo. | B Hours | C Hours |
|---|---|---|---|---|---|
| WC2 | VTM | 112-001 and 112-003 | 2 | 100 | 1000 |
| WC3 | TWT | 10 and 20 mw output except WC4 tubes | 12 | 500 | 2000 |
| WC4 | TWT | 112-040 and 112-047 | 12 | 2000 | - |
| WC5 | TWT | 1 watt output except WC6 and WC7 tubes | 12 | 1500 | - |
| WC6 | TWT | 112-046, 112-065, & 112-072 | 12 | 1000 | - |
| WC7 | TWT | 112-057, 112-080, & 112-081 | 12 | 250 | 1000 |
| WC8 | TWT | 2, 10, & 20 watt output except WC9 tubes | 12 | - | - |
| WC9 | TWT | 112-055 | 2 | 50 | 500 |

* WC# denotes the corresponding warranty period(s) shown in the right-hand column(s) and is used for cross-reference to this warranty statement from other documents.

### WARRANTY FOR ALL BWO TUBES

Tubes are warranted unconditionally against defects in workmanship, materials, and construction within the period shown below, without regard to the number of heater hours used.

| Warranty Condition* | Tube Type | Warranty |
|---|---|---|
| WC10 | BWO | Warranted unconditionally for one (1) year. |

WARRANTY CONDITIONS APPLY ONLY TO TUBES LISTED ABOVE WHICH ARE USED IN ALFRED CATALOG INSTRUMENTS.

This warranty applies only to tubes sold after July 1, 1969.

## TUBE SERVICE REPORT

TO OBTAIN WARRANTY CREDIT THE TUBE SERVICE REPORT MUST BE COMPLETED AND RETURNED WITH THE TUBE.

## RETURN PROCEDURE

In case a tube or instrument fails, please contact the factory or your local sales representative for advice or authorization to return either the tube or the instrument to the factory. NO TUBE OR INSTRUMENT WILL BE ACCEPTED FOR REPAIR OR CREDIT ADJUSTMENT WITHOUT WRITTEN AUTHORIZATION AND ACCOMPANYING SERVICE REPORT.

When the authorization is received, pack the tube in a rigid container (use original carton if available) at least 4" larger than the tube in each dimension. Wrap the tube with 1/4" of soft padding material and heavy kraft paper before placing in container. Pack at least 2" of resilient dunnage such as rubberized hair, foam, or similar shock absorbing material completely around the tube. Mark the container "FRAGILE" and ship PREPAID via air freight, air express or rail express. Do not ship via parcel post or air parcel post since experience has shown that fragile items are more apt to be damaged when shipped via these methods.

Use similar wrapping, packing and shipping provisions for an instrument. At least 6" of rubberized hair (or equivalent shock absorbing material) is required for an instrument.

## IN-WARRANTY FAILURE - BWO AND VTM TUBES

BWO and VTM tubes which fail in warranty will be replaced with a new tube. In case a tube fails, please issue a purchase order for a new tube at the tube list price and return the defective tube. Warranty credit will be issued and deducted from the price, subject to tube manufacturer's verification that failure was caused by tube malfunction. To qualify for maximum credit, it is essential that the defective tube be properly packed and returned within 30 days after failure.

## REPAIRABLE OR IN-WARRANTY FAILURE - TW TUBES

If the returned tube is found to be repairable, the user will be asked to issue a purchase order for repair charges determined by the original tube manufacturer. In general, the repair will be at no cost if the tube is in warranty and there is no evidence of misuse or abnormal conditions of operation.

## WARRANTY CREDIT

Any applicable credit allowed under the terms of this warranty applies only toward the purchase of a replacement tube from ALFRED ELECTRONICS. Cash settlements will not be made. In terms of this warranty, a replacement tube must be the same type as that on which credit is allowed. Credit for one tube only may be applied toward the purchase of a single replacement tube. Warranty credit remains in effect for a maximum of six (6) months from date ALFRED ELECTRONICS notifies the customer. All credits will be based on the purchase price of the tube which prevails at the time the order for a replacement tube is received by ALFRED ELECTRONICS.

## BWO RF CABLES

RF OUTPUT CABLE MUST ACCOMPANY BWO TUBES returned for warranty credit, repair or replacement. If rf output cable is NOT returned, the cable price is added to the normal BWO repair or replacement charge. For prices see Replacement Tube Price List.

## SPECIAL CONDITIONS

If a returned tube or instrument proves not to be defective after test and evaluation at ALFRED ELECTRONICS, the tube or instrument will be returned at the customer's expense.

The final determination as to whether the tube failed in normal operation thereby bringing it under the applicable warranty or whether the tube was misused thereby excluding it from application of the warranty provisions, lies solely with the tube manufacturer.

Data, warranty credit, and prices subject to change without notice.

7/6/71

Service Report

Instrument Model _____ Serial No. _____ Date Received _____

TW/BWO Tube Type _____ Serial No. _____ Date Received _____

Date First Tested _____ Date Placed in Service _____ Date of Failure _____

Total Number of Hours of TWT/BWO Heater Operation _____

_____

1. Was operation normal just prior to failure? Yes _____ No _____

2. If not, what was done to adjust it? _____

_____

3. Has proper cooling been maintained during tube operation? _____

_____

4. Did helix overcurrent tripout occur? _____

5. Was environment normal? (specify) _____

_____

6. Symptoms (describe failure) _____

_____

_____

7. Operating conditions at time of failure (indicate any unusual conditions) _____

_____

_____

8. Name of person to contact regarding evaluation of failure _____

Telephone No. _____ Signature _____

Title _____

Date _____

**SINGER**
INSTRUMENTATION

The Singer Company, Palo Alto Operation, 3176 Porter Drive, Palo Alto, California 94304
Telephone: (415) 493-3231 TWX: 910-373-1765

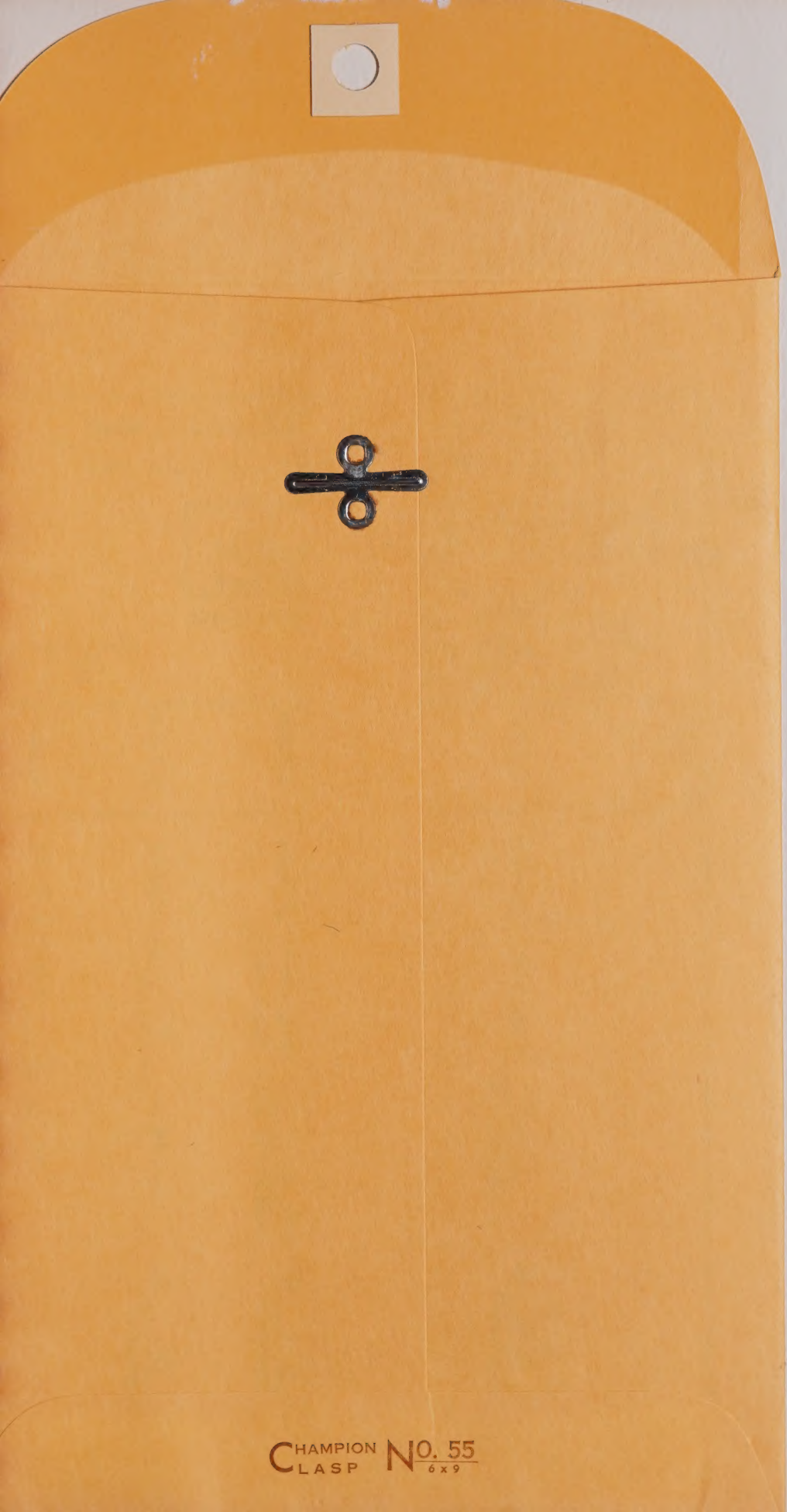
# SHIPMENT DAMAGE CLAIM

The instrument should be tested as soon as it is received. If it fails to operate properly or is damaged in any way, a claim must be filed with the carrier. Have carrier agent inspect damage to instrument and packing crate and forward us a copy of his written report. You will then be advised of replacement or repair arrangements and disposition of the equipment. Please include model number, type number and serial number when referring to this instrument for any reason.

# REPACKING FOR SHIPMENT

The instrument should be packed in the original carton. If unusable or not available, use a wooden box with approximately three inches of excelsior or other shock-absorbing material surrounding the instrument. If desired, packing services of a local transfer and storage company may be employed.

**SINGER**
**INSTRUMENTATION**


CHAMPION CLASP NO. 55
6 x 9